

**DESIGN, CONSTRUCTION, OPERATION AND
MAINTENANCE OF RAW WATER PUMPING STATION AND
RAW WATER TRANSMISSION MAIN FROM PIPLI PUMPING
STATION (PARIYEJ RESERVOIR) TO WATER TREATMENT
PLANT (WTP) AT TP1 IN DHOLERA SIR**

PART 3

Manual for Construction Procedures (including Quality, Health, Safety, Environmental Procedures)

**Gujarat Industrial Corridor Corporation,
6th Floor, Block No.1 and 2, Udyog Bhavan,
Sector – 11, GH-4 Circle,
Gandhinagar – 382017
Gujarat (India)**

**Prepared By:
Program Manager for New Cities (PMNC)**

AECOM

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Abstract:

Purpose of this note is to establish guidelines for monitoring the site progress, safety, health & environment and QA / QC of the work executed in DSIR project.

1.0 Introduction

1.1 Purpose

The purpose of this Manual for construction procedures is to establish uniform policies and procedures that will be used by Employer for implementation of technical and administrative tasks for all construction contracts in Dholera Special Investment Region. This manual is a guideline document for implementation of construction activities in all the projects. All Construction Companies working in DSIR projects are responsible for implementing the manual in their respective projects.

This manual is not intended to be a step-by-step procedure for each activity. It is a document that outlines general activities, procedures, and requirements for all the projects throughout the construction phase of projects. These procedures must always be read and implemented in conjunction with the related Contract Conditions.

1.2 Scope

This Manual for Construction Procedures is prepared to uniformly direct and control activities during the construction of DSIR projects. All Contractors & Consulting Engineers working on DSIR projects are required to know specification requirements for their contracted work as issued by the Employer. This manual is designed to cover most issues involved in a large construction project. The size, scope, and technical complexity of the contract shall determine the relevant procedures specified in the manual.

2.0 Program Description

2.1 Introduction

Government of India envisaged the development of Delhi Mumbai Industrial Corridor (DMIC) aligned with Multi-modal High Axle Load Dedicated Freight Corridor (DFC) between Delhi and Mumbai, covering an overall length of approx. 1,500 km, with the formation of Delhi Mumbai Industrial Corridor Development Corporation Limited (DMICDC) as SPV, under the auspices of Dept. of Industrial Policy & Promotion of Govt. of India. The DMIC influence area in Gujarat is 120,706 sq. km which is 62% of the total area of the state covering 18 out of 26 districts and the population under influence is approx. 37.3 million which is 74% of the state population.

2.2 Dholera Special Investment Region

The Dholera Special Investment Region (DSIR) is the first investment region to be implemented under the Delhi Mumbai Industrial Corridor (DMIC) project. As a major new city, Dholera will be a Greenfield industrial hub located approximately 100km south of Ahmedabad in Gujarat, with a population of 2 million and an employment

base of over 800,000. Delhi Mumbai Industrial Corridor Development Corporation Limited (DMICDC), with support of Gujarat Industrial Development Board (GIDB) and Dholera Special Investment Region Development Authority (DSIRDA), plan to create an economically and socially balanced new-age city with world class infrastructure and highest quality-of-life standards and sustainability in the urban development context.

The master planning process undertaken for DSIR established the guiding framework for this node. The framework is being implemented through six Town Planning schemes covering the entire DSIR. Town Planning Schemes 1 and 2 (TP1 and TP2) have been notified and shall be developed under Phase I of the DSIR development. Trunk infrastructure projects that shall be implemented as part of the DSIR Phase I development include roads and services within the TP1 and TP2 development areas, water supply, sewage treatment, power supply, solid waste management, information and communication technology (ICT) systems, etc.

TP1 and TP2 urban development covers a total area of around 150 sq. km. For practical implementation purposes, the total area of TP1 and TP2 is broken down into three packages: TP1; the area to the west of the Central Spine Road (SH6) in TP2 (TP2W), and the area to the east of the Central Spine Road (SH6) in TP2 (TP2E). TP1 covers an area of approximately 51 sq. km, TP2W covers an area of approximately 45 sq. km, and TP2E covers an area of approximately 57 sq. km.

Activation Area: It is decided to start the infrastructure development from an area of 22.54 Sq. Km called activation area in part of TP2E and part of TP4. The reason for selecting this area is the largest availability of government land. The government land parcel is approx. 18 Sq. Km in the activation area.

3.0 Projects

Following are the list of projects to be executed in the DSIR area as the first phase of the development.

3.1 Roads & Services

The road right-of-way (ROW) will include storm water drainage, water supply, sewerage, power, telecommunications and gas. The roads and services are envisaged to be developed in a phased manner. Overall projects for construction of approx. 520 kms of roads of ROW varying from 70 meter to 12 meter, comprising main carriageway, service roads, foot path, cycle track, plantation strip, street lighting to be developed through Design-Build (DB) contract. The part of this project is also a project of Activation Area implementation.

3.2 Potable Water Supply System

With a zero discharge concept of waste water management and potable water demand also reduced with the addition of a separate industrial water supply, the total potable water demand for the project is estimated to around 300MLD. The potable water demand for Phase I is estimated as 90MLD. It is assumed that treated water from the reservoirs located at each TP are distributed to individual plots through a cluster of pipes running on both the sides of the carriageway of all the roads except the local roads of ROW lesser than 18 metres. The main components of underground potable water supply HDPE pipeline network comprises of approx. 1036 kms, overhead tanks, underground reservoirs, interim pumping stations including electrical and instrumentation works and service connections are envisaged on both side of the road in service corridor. The part of this project is also a project of Activation Area implementation.

3.3 Recycled Water Supply System

Waste water generated in DSIR shall be treated through the Sewage Treatment Plants (STPs) for domestic sewage and Common Effluent Treatment Plants (CETPs) for industrial effluent. The tertiary treated water from the sewage treatment plant and effluent treatment plants located at each TPs along with tertiary treated water from secondary treated sewage are distributed to individual plots through a cluster of pipes running on both the sides of carriageway of all roads except the local roads of ROW lesser than 18 metres. The main components of underground recycled water supply HDPE pipeline network comprises of approx. 1036 kms, underground reservoirs, interim pumping stations including electrical and instrumentation works and service connections. The part of this project is also a project of Activation Area implementation.

3.4 Domestic sewage collection system

The STPs would be constructed for treatment of sewage generated from residential, commercial and other activity from the phases. The domestic sewage from each plot shall be collected at the collection chambers which are located within the property boundary. The total domestic sewage generation for the project is estimated to around 345 MLD. The potable water demand for Phase I is estimated as 106 MLD. The main components of underground domestic sewage collection system comprising RCC pipeline network of approx. 1036 kms, manholes, vent pipes, intermediate pumping station, collection tanks, including electrical and instrumentation works for formation of domestic sewage collection system. The part of this project is also a project of Activation Area implementation.

3.5 Industrial Effluent collection system

The CETPs would be constructed for treatment of effluent generated from industrial activity from the phases .The industrial effluent from industrial plot shall be collected

at the collection chambers which are located within property boundary. The Industrial effluent pipeline shall on either side of roads restricted to the industrial zone. The treatment standard will enable the treated effluent to be reused for the purposes of industrial water non-potable use, irrigation water, flushing, and other non-potable purposes. The total effluent generation for the project is estimated to be around 266 MLD. The effluent generation for Phase I is estimated as 75 MLD. The main components of underground industrial effluent collection system comprising of RCC pipeline network of approx. 272 kms, manholes, vent pipes, intermediate pumping station, collection tanks, including electrical and instrumentation works in service corridor and effluent treatment plants and effluent out fall. The part of this project is also a project of Activation Area implementation.

3.6 Storm Water collection system

The main components of underground storm water collection system comprising RCC pipeline network of approx. 1036 kms, manholes, vent pipes, intermediate pumping station, collection tanks, pumping stations including electrical and instrumentation works for formation of collection system of storm water run-off within TP areas through RCC pipeline network & disposal. The part of this project is also a project of Activation Area implementation.

3.7 River Training / Bunding

Flooding is a critical issue that may adversely impact the development. DSIR is located in the flood plain of three rivers, from Sukhbhadar River in the north to the Lilka and Utavali at the south. The river sections starting from SH36 will be widened to around 60m width which further widens to up to 250m width in the DSIR area. 1-3m high engineered bunds will be constructed along the banks of the widened river sections. The entire system will be designed for a 1 in 100 year storm. The bund and the banks within DSIR are proposed to be treated aesthetically as parks, open spaces, and trails for use by the population in DSIR. River training and bunding is essential along the river course for 200 km in length for flood protection.

3.8 Administrative and Business Centre of Dholera (ABCD)

ABCD is proposed, to serve as administrative functions of the city. The ABCD site is connected to the 55m arterial roads from the expressway by a 24m ROW loop. This building will accommodate DSIRDA's office, TPO offices, SPV offices, Command and Control Centre and a skill development centre. The DSIRDA building is envisaged to be at least a LEED GOLD rated building with facilities to accommodate the entire staff required by DSIRDA for the city of Dholera. Total build up area of ABCD building will be approximately 36000 sq.m.

3.9 Raw Water & Potable Water

The raw water conveyance arrangements from Saurashtra Branch Canal with intake structure, pumping stations, raw transmission line, water treatment plant, potable water transmission main, MBRs & distribution network.

3.10 Waste Water

Waste water from AMC Vasna to TP1 tertiary treatment plant and to store in MBRs for industrial & agriculture purposes. The secondary treated sewage from the treatment plants at the Vasna (Ahmedabad) STPs shall be collected through pipes to the common equalisation / balancing tanks near Ahmadabad. Then the secondary treated sewage is conveyed for an approximate distance of 100 km to the proposed Tertiary Treatment plant (TTP) within Dholera area. The secondary treated sewage transmission main will follow the ROW of the proposed Ahmedabad – Bhavnagar expressway.

3.11 Power Transmission and Distribution

Effective power infrastructure will contribute to the economic prosperity of DSIR. Power demand for DSIR Phase I has been assessed as 1,300MW. This will be achieved through the development of sustainable state of the art infrastructure for power generation, transmission and distribution:

- Source power for TP1 & TP2 (Phase 1 of the DSIR development) locally from Gujarat Grid
- Plan for thermal and/or gas power plant for Phase 2 – expected to create a separate Special Purpose Vehicle (SPV) for generation
- 400 kV transmission lines are expected to run around the periphery of DSIR
- Power infrastructure shall be built around energy saving smart technologies
- Smart metering for consumers (electricity and gas).
- Form SPV with a local distribution company.

The part of this project is also a project of Activation Area implementation.

3.12 Information and Communication Technology (ICT)

Information and communication technology (ICT) covers the development of comprehensive voice, data, video and IT infrastructure, aided with present day applications for education, local governance, medical support, transportation, data mining, efficient buildings, building/home security, etc.

The objective of the ICT project is to build a smart, attractive modern city of Dholera that will provide traction to the economic development of the region. ICT infrastructure is envisaged to boost sustainable economic development and a high quality of life for the residents, with efficient management of the city's infrastructure. The smart city concept supported by ICT shall bring high efficiency and active citizen participation. The part of this project is also a project of Activation Area implementation.

3.13 Solid Waste Management

Estimated municipal waste amounting to 500 TPD to convey and segregate by an automatic segregation plant. Waste-to-Energy treatment would be considered and the ash generated would be disposed only in the landfill. The part of this project is also a project of Activation Area implementation.

3.14 Central Spine Road (SH6)

The Gujarat State Road Development Corporation Limited (GSRDC) is developing an access controlled expressway between Ahmedabad and DSIR to serve as a central spine road for DSIR. The proposed Ahmedabad-Dholera Expressway starts near Sarkhej on Sardar Patel Ring Road and ends at the district boundary of Ahmedabad. It also includes the proposed Dholera Airport connectivity. The proposed road cross-section of the expressway is a 6-lane dual carriageway within an overall ROW of 100m, which will be capable of accommodating a maximum of ten lanes.

3.15 MRTS

Mass Rapid Transit System (MRTS) between Ahmedabad and DSIR is part of the plan to develop self-sustainable rail based transportation system in order to provide connectivity both within DSIR and between DSIR and Ahmedabad. The alignment of the MRTS corridor is proposed to be along the Ahmedabad-Dholera expressway with 5 nos. intermediate stations. MRTS will start from Visalpur on SP Ring Road at Ahmedabad and terminated at CBD in DSIR.

3.16 Freight rail from DSIR to DFC (via Bhimnath)

An existing freight rail system (Bhanagar-Botad-Surendranagar-Ahmedabad) exists between Sundernagar Railway Station to Bhimnath via Botad. The link between Botad to Bhimnath (existing Botad – Bhimnath – Tagdi – Dholka – Ahmedabad) is metre gauge which is being converted to broad-gauge by Western Railway. Rail connectivity between DSIR and Bhimnath is part of the plan to develop a feeder line in order to provide freight connectivity from DSIR to the Western Dedicated Freight Corridor (DFC) via the Botad – Surendranagar-Ahmedabad railway line. The freight traffic generated from DSIR industrial hub will be handled through this connection to the Western DFC corridor

3.17 Airport

The airport is envisaged to cater to not only DSIR and its hinterland, but also to traffic overflow from Ahmedabad international airport. Greenfield international airport is proposed on northern side of DSIR located at approx. 7 Km from DSIR boundary. The airport is slated to have two runways capable of handling wide-bodied long-haul aircrafts such as the A380.

4.0 Project Organization Chart and Responsibilities

The Employer will enter into a contract with several Contractors to perform construction in accordance with prescribed plans and specifications made part of the Contract. Within 30 (thirty) days of the Appointed Date, the Contractor shall submit to the Employer and the Employer's Engineer a programme for the Works, developed using networking techniques giving the details such as Contractor's organisation for the Project including responsibility matrix, the general methods and arrangements for design and construction, environmental management plan, Quality Assurance Plan including design quality plan, traffic management and safety plan covering safety of users and workers during construction, Contractor's key personnel and equipment. The Employer or Employer's authorized representative will review the submission & shall instruct the Contractor in case any modification is required. The requirement of staff shall depend on the nature of project and the Contractor has to put sufficient competent persons in order to execute the project with due diligence to all the aspects mentioned in the contract.

4.1 Organizational Chart and Staffing

The organization chart submitted by the contractors shall consist of the following position in general. The positions mentioned below are indicative in nature and shall depend on nature of project. The number of persons for each category shall be mentioned by the contractor in line with the contract document.

- Project Construction Manager
- Site Construction Manager
- Project Controls Manager
- Planning Engineer
- Billing Manager
- Project Design Manager
- Design Engineers

- Site Engineers
- Safety Manager
- QA/QC Manager
- Plant Manager
- Quarry Manager
- Document Controller
- Administration Manager
- Materials Manager

The above mentioned staffing requirement is for guideline only. The requirement and numbers for every position shall depend on project size and nature of work.

4.2 Staff Responsibilities

Responsibilities of the various positions indicated above are illustrated below. The responsibilities mentioned are indicative in nature and not limited to the mentioned points. This may vary based on the project requirement or under any specific circumstances

4.2.1 Project Construction Manager

Specific duties during construction include the following:

- Implementation and monitoring of scope, quality, schedule, and cost of construction and post-construction phases of the project.
- Establish construction team and provide project team leadership by clearly defining project objectives and member roles.
- Coordination with Project Design Manager in determining scope of services during construction.
- Monitor implementation of project with proper QA/QC through QA/QC manager.
- Ensure construction contract meets contract requirements. This shall include onsite visits and the monitoring of submittals, field reports, and test reports.
- Monitor implementation of Safety Plan through qualified safety manager.

- Ensure compliance with Employer environmental requirements.
- Ensure implementation & compliance of GOI & GOG legal framework.
- Arrange and conduct construction meetings; ensure meeting minutes are properly prepared, recorded, and issued.
- Review daily and other inspection reports.
- Prepare monthly progress report to Employer reflecting the status of the construction contract.
- Provide recovery schedules as changes occur to ensure schedule remains in compliance with overall project goals.
- Conduct final inspection and establish final punch list.
- Ensure proper final payment documentation, final approved operations and maintenance (O&M) manuals, and as-built drawings reviewed and approved by Employer's Engineer. Verify completion of punch list components and O&M training.
- Manage document control system (using Proliance) to ensure proper filing of construction phase documents and maintain such files until submitted to Employer at project close out.

4.2.2 Site Construction Manager

Specific duties during construction include the following:

- Execution of work at site with proper specification & approved drawings as per the contract requirement.
- Arranging resources like manpower, materials & machineries required for the work.
- Ensuring adherence to safety requirements.
- Ensuring QA/QC and documentation.
- Informing Employer's Engineer for inspection and coordination.
- Over all coordination with all entities.

4.2.3 Site Engineers

Site engineers shall be responsible for executing the work at site as per GFC drawing and specifications.

4.2.4 Project Control Manager

The Project Controls Manager shall be responsible for overall project controls; scheduling, cost trending, cash flow projections, cost to date and cost to completion reporting, and consolidating inputs from all parties into a single monthly report.

4.2.5 Planning Engineer

Planning Engineer shall assist the Project Control Manager for project control activities. Contractor shall decide the numbers of planning engineer as per the volume of work.

4.2.6 Billing Engineer

Billing Engineer shall be responsible for generating of invoice and proper supporting documentation.

4.2.7 Project Design Manager

Project Design Manager shall be responsible doing detailed design, obtaining approval, preparation of GFC drawing etc.

4.2.8 Design Engineer

Design engineers shall assist the Project Design Manager for design related works.

4.2.9 Safety Manager

Safety Manager shall be responsible for the following activities:

- Preparation of project safety plan
- Preparation of job risk analysis
- Recommending & ensuring safety requirements based on risk analysis
- Arranging tool box talks on safety on a daily basis
- Ensuring use of PPEs at work site
- Arranging safety training for site staffs

- Maintain records of accident free man hours
- Maintain record of reportable accident
- Maintain record of near miss accidents
- Administer penalty imposition for safety violation
- Inspection of site establishment regularly & ensure implementation of SH&E norms.
- Maintaining lessons learned log

4.2.10 QA/QC Manager

QA/ QC Manager shall be responsible for the following activities

- Maintaining the site laboratory with proper lab equipment required for work.
- Periodical calibration of lab equipment.
- Preparation of Inspection Test Plan (ITP) as per contract specification and /or requirement mentioned in relevant Indian / US / UK standards and obtaining approval from Employer's Engineer.
- Testing of ingredients required for work as per ITP.
- Preparing Mix Design and obtaining approval.
- Conducting sampling and testing as per specification requirements.
- Maintaining records of all tests & obtaining certification from Employer's Engineer.
- Compilation and submission of all reports to Employer's Engineer and Employer.
- Maintaining a lessons learned log

4.2.11 Plant Manager

The Plant Manager shall be responsible for operation and maintenance of all the plants and equipment required for construction. He shall be taking care of proper maintenance in order to avoid break downs of equipment.

4.2.12 Quarry Manager

Quarry Manager shall be responsible for obtaining permission for quarry and its operation. He shall be responsible for production at quarry and maintenance of crusher.

4.2.13 Document Controller

Document controller shall be responsible for maintaining record of all incoming and outgoing documents. He shall be responsible for filing and retrieval of all documents. He shall also be responsible for uploading all the documents in PMIS.

4.2.14 Administration Manager

Specific duties during construction include the following:

- Obtaining labour licence.
- Adhering to legal requirements of GOI and GOG.
- Ensuring compliance of labour laws by labour contractors.
- Ensuring construction workers payment by respective sub-contractors.
- Housekeeping of site establishment.
- Inspection and maintenance of construction worker housing.
- Arranging logistic facilities for staff members.
- General administration of site.

4.2.15 Materials Manager

Materials manager shall be responsible for timely procurement and storage of materials required for the work. Materials Manager shall maintain the records related to procurement of items including inspection reports and manufacturers test certificate (MTC). The MTC shall be handed over to QA/QC Manager for forwarding it to Employer's Engineer / Employer. Materials Manager shall maintain the records of material received, issued & in stock on daily basis.

4.2.16 Employer's Engineer

Employer shall designate an Employer's Engineer as an authorized representative to observe and inspect the project and the materials to be used therein.

Specific duties during construction include the following:

- Observe Contractor and subcontractors work during construction activities in accordance with contract requirement, ensuring completion of the project according to the Contract Documents.
- Observe implementation of the Safety, Health & Environment Plan by the Contractor.
- Approve Inspection Test Plan prepared by Contractor in consultation with Employer.
- Witness field tests as per the requirement of Inspection Test Plan.
- Review field progress against approved schedule and document/report variations.
- Document construction activities by taking photos and preparing Daily Inspection Report.
- Review progress payment applications with Contractor and make recommendations on percentage complete for pay items to Employer.
- Maintain records of changes with respect to GFC drawings and review as-built drawings prepared by the Contractor.

5.0 Construction Management Procedures

5.1 General Onsite Office Administration

The Project Construction Manager shall maintain an office at the project site if required. The Project Construction Manager and field staff shall be responsible for implementing and maintaining office procedures and policies as generally described in the following paragraphs.

5.2 Working Hours / Holidays

Regular working hour shall be 9.00 am to 6.00 pm including one hour for lunch on all working days. Working days at site shall be from Monday to Saturday i.e. 06 days in a week.

The works can be allowed to be carried out during night, Sundays or authorized holidays in order to enable him to meet the schedule targets and the work shall require almost round the clock working. Contractors working in DSIR project have to obtained permission from Employers / Employers representative. Permission shall be granted keeping in view the following minimum requirements:

- The provisions of relevant labour laws being adhered by the contractor
- Adequate lighting, supervision and safety measures are established to the satisfaction of the Engineer-in-Charge/Employer.
- Presence of safety engineer at work site.
- The construction programme given by the Contractor and agreed upon by the Engineer-in-Charge/Employer envisages such night working or working during Sundays or authorised holidays.

5.3 Correspondence Procedures

5.3.1 Communication Plan - Objective

The objective of this plan is to define guideline for communication methods and protocol to be followed in DSIR projects in order to have proper flow of communication and avoid conflicts.

5.3.2 General

All issues of importance to the administration of the Contract must be substantiated by permanent records such as correspondence, notes, and photographs and such. It is important to summarize verbal communications with notes covering conferences, telephone calls, and discussions, giving the date, location, parties involved, and important issues discussed. PMIS document management software may be utilized for the purpose of standardizing correspondence, ensuring electronic filing and retrieval, and providing access to key persons involved in the project to the level of their security. It is expected that participants in the project shall utilize PMIS to the extent described herein, including the use of appropriate forms and document filing and storage to allow retrieval by others at a later date. Any and all official communication shall be recorded and uploaded on the PMIS.

5.3.3 Written Correspondence

Contractual communications have a legal basis. Out of all the correspondences, written correspondence is the most common and very important. Instructions regarding format and distribution are provided below. All forms of communication shall contain the appropriate reference number and date.

5.3.4 Letters and Memoranda

Construction related letters and memoranda may be prepared in the conventional manner using word processing software. Letters for such communication shall be done on original letter heads. Memoranda shall contain logos and format shall be approved.

5.3.5 E-Mail

E-mail correspondence should be used only for messages which, by nature, have no need to be documented. If a message needs to be documented, then it needs to be scanned and uploaded on PMIS.

5.3.6 Correspondence Management and Control

PMIS provides many functions to facilitate correspondence production, management, and control. Documents should be scanned and uploaded to the appropriate file in website. Documents residing in PMIS can be accessed for reading by anyone having the security clearance. Project staff is expected to become familiar with these management and control functions and utilize them as appropriate.

5.3.7 Document Numbering

To facilitate document filing and retrieval, each document to be scanned and uploaded to PMIS duly giving a proper document number and the numbering system shall be shared with the contractor at the time of kick off meeting by Employer or Employer's authorized Representative. The document number to be assigned to each document shall comply with the reference numbering system. .

5.3.8 Distribution

Correspondence send by any party shall be addressed to Employer / Employers representative on hard copy. Copy of each correspondence shall be routed through Document controller. The document received by the Document controller shall be considered for the Project File, which shall be used for scanning and uploading to PMIS and for filing, as a hardcopy, in a folder to be maintained in the Field Office. To the extent possible, letters and memos should be distributed electronically to the addressee and those copied.

5.3.9 Correspondence Reply

Incoming correspondence from Contractor shall be received by the document control department and shall be acknowledged with date and stamp and scanned copy shall be uploaded to the PMIS. The copy of the correspondence shall be given to the concerned department. The concerned department head shall respond to the correspondence in following ways:

- Acknowledgment of receipt. Upon receipt of incoming correspondence, Document controller shall date stamp copies and forward it to Project Construction Manager. The Project Construction Manager shall mark the copies for distributing to concerned team members. The Document controller shall assign file numbers to the file copy, and designate necessary action or information for routing.

- Reply in full.
- Interim reply stating date by which a full answer can be expected.

5.4 Correspondence Logging

Document Control Department shall maintain correspondence log for incoming and outgoing correspondence between Contractor and other agencies. All correspondence must have letter number, date of letter, subject, subject file number, and cross-reference letter number (cross-referencing shall be done when applicable for ease of ready reference). To the extent possible, responses to incoming correspondence shall be logged on the same line with response letter number and date.

5.4.1 Meetings, Conferences, and Discussions

It is imperative that accurate minutes be recorded to avoid misunderstandings regarding agreements and conclusions reached during meetings, and to ensure that further documentation is recorded accurately and presented in a timely manner. These records shall be generated in “Minutes of Meeting” form and signature of concerned parties shall be obtained. The “Minutes of Meeting” prepared shall be uploaded to PMIS. After the minutes have been prepared in final form, one copy shall be sent to each attendee electronically.

5.4.2 Project Files

Project Files shall be maintained by the Document Controller. The purpose of the project file is to provide secure storage and ready retrieval of project records. The project files shall contain correspondence and documents pertaining to the administration of the project contract. A complete file shall be kept in the Field Office onsite, as well as electronically on PMIS.

Three basic file containers shall be used. They include:

- Standard legal four or six drawer, steel, lockable file cabinets.
- Three-ring binders.
- Drawing file or rack.

Project files shall be arranged consistent with Uniform Filing System.

5.4.3 Visitor Control

Casual visitors to the site shall be discouraged due to safety considerations. All visits shall be scheduled and arranged through the Project Construction Manager’s office.

The Project Construction Manager shall inform the Administration Manager and Safety Manager of scheduled visits or tours.

The Administration Department shall maintain a visitor register, and visitors shall be required to sign the register and wear an I.D. badge. The Safety Manager shall ensure that visitors wear appropriate safety equipment during their visit.

Visitors or inquiries from the press or news broadcasters shall be referred to Employer's authorized representative for granting permission for such visitors.

5.4.4 Photographs

Each contractor and Employer's Engineer shall keep digital camera on site office in order to obtain an adequate photographic record of the progress of the work. Photographs shall be taken by Project Construction Manager, Construction Manager, Site Engineer or Safety Manager to cover the following items:

- Progress of the work.
- Accidents or damage.
- Unsafe or hazardous working conditions.
- Unusual construction techniques.
- Areas where claims and/or changes are anticipated.
- Movement or possible damage to surrounding land or structures.
- Quality incidents

When appropriate, digital photos shall be uploaded to PMIS by attaching them to the Daily Inspection Report. The print out of such photos shall be maintained in a file by each contractor. These shall be submitted to Employer along with the monthly progress report. Photos can also be submitted as appropriate in correspondences.

5.4.5 Document Control

The Contractor shall obtain one copy of the document of the correspondence protocol. Contractor can make additional copies as required at his own cost for his use. Minimum one copy of the document shall be kept at site office for reference. The circulation of document shall be properly controlled by Contractor and it shall not be given to any person or entity outside DSIR projects.

5.4.6 Change Orders

The Employer shall issue change order to the Contractor or Employer's Engineer based on project requirement. A detailed mechanism shall be described for formulation of change order management in the contract conditions. The issuance of Change orders shall follow standard correspondence protocols.

5.4.7 Contract Document Revision Log

The Project Construction Manager shall maintain and distribute a log of field instructions, change orders and drawings that shows the latest current revision and which revisions have been superseded since contract award. During construction, it is the primary responsibility of the Contractor to ensure GFC Drawings are kept current. As a minimum, GFC Drawings shall contain the following:

- Revisions, additions, or deletions; accompanied by sufficient annotations to adequately describe the as-built condition.
- Field Work Directive or Change Order numbers shall be placed next to the revisions, as appropriate.
- Surveyed measurements of final locations and elevations.
- Colour codes shall not be used to describe as-built conditions, unless they can be easily identified on black and white photocopies.

Employer's Engineer shall coordinate with Contractor on a timely basis to review Contractor's ongoing maintenance of as-built documents to ensure revisions, additions, and deletions are recorded complete and accurate in a timely manner. Monthly reviews shall be made by the Employer to verify accuracy. In addition to the field marked-up as-built drawings.

At the close out of the project, the Contractor shall submit 06 copies of as-built drawings in hard copy and in electronic form to the Employer.

5.4.8 Shop Drawings and Samples

For brought out supply items like plants and equipment, review of shop drawings, working drawings, catalogues, O&M manuals, and on factory inspection is necessary to ensure materials and components to be supplied for incorporation into the work satisfy the criteria established by the Contract.

5.4.9 Submittal Schedule and Review Procedures

The Contractor is required to submit the project schedule at the start of the work. The submission schedule shall be reviewed by the Employer's Engineer and Employer

to ensure sound logic and timely completion. The Employer & Employer's Engineer shall review the construction schedule periodically on a weekly and monthly basis. The slippage in the schedule shall be intimated to the Contractor. The Contractor has to submit the catch up plan justifying the action needs to be taken to overcome the slippage. The Contractor shall implement the catchup plan in order to overcome the slippage.

5.5 Clarifications

Each construction project expects that additional information shall be required throughout duration of project. Information shall be provided by the Design Consultant as required, and when requested by the Contractor, Employer's Engineer or the Employer.

5.5.1 Payment Requests

The contract document shall specify the manner in which Contractor payment requests are to be submitted and the documentation required to substantiate the request. For each Contract the Contract document shall specify the detail methods of measurement to be used to determine the amounts earned. The Employer's Engineer and Employer shall review each Contractor payment request for completeness with respect to physical completion and QA/QC records. After this verification, the invoice of earned amounts will be entitlement for payment.

5.5.2 Calculation and Recording of Pay Amounts

The progress payments shall be calculated based on the specific provision of the contract and the guidelines shall be specified to establish the criteria for measurement and payment of all items in all the contract documents. There are numerous acceptable methods to implement these requirements and thus determine the correct amount to be paid. The following are the most common methods used.

1) Theoretical Computations

Items such as concrete, excavation, embankment, paving, clearing, and grubbing are measured and paid to neat lines or other established pay lines. Therefore, the amounts must be arithmetically calculated based on accurate dimensions determined from the Contract Drawings or from field surveys. The computations must be prepared on calculation sheets that are neat, legible, date signed, and assigned a pay number and title. Reference should be made to applicable drawings. Sketches may be attached to supplement the calculations.

2) Field Measurements and Verifications

Numerous items require measurement in place. The measurement of such items

must be made while they are accessible during installation. The Contractor must be present while such measurements are being made in order to prevent disagreement.

3) Lump Sum Pay Amounts

The contract bidding schedule contains a lump sum bid. All progress payments against the lump sum bid must have supporting data in order to ascertain a reasonable partial payment.

The method of measurement shall be defined in each contract document considering project mix, transparency and ease in measurement.

4) Material Delivered but Not Installed

The contract document shall define the payment schedule for supply items like plants and equipment. The payment schedule shall specify the procedure for material delivered onsite to be taken into consideration in computing progress payments. Payment for these materials can be made only after the Contractor has supplied the plants / equipment at site long with adequate documentation related to inspection and quality checks.

5) Monthly Invoice for Payment to Contractor

The Contractor is responsible for the preparation of the monthly invoice in accordance with the Contract. Contractor shall obtain certification with the Employer's Engineer. Employer's Engineer shall certify the measurement which complies with the QA/QC requirement as per the specification requirement. The invoice shall be supported with the required QA/QC document. After the certification the Contractor shall submit the invoice to Employer for processing for payment.

6) Payments Withheld

The Employer will not certify payment for any work for which a compliance of non-conformance is pending. The payment of such work shall be processed only after the compliance is done. Contractor is required to take appropriate action to rectify any work for which non-conformance report is issued. After compliance is done, the contractor has to get the work inspected by Employer's Engineer and obtain the certification of the corrective work done. Contractor is required to submit the inspection report along with the invoice in order to process the withheld payment.

5.6 Project Meetings

5.6.1 Objective

The objective of the Project Meeting is to have discussion with the concerned persons from Employer, Employer's Engineer and Contractors on various issues pertaining to progress of work and take decision on mitigation measures.

Project meetings shall be held on a scheduled basis for several specific reasons:

- To acquaint the Employer, Employer's Engineer and Contractor with each other's staff, expectations, procedures, and contact information.
- To review work progress.
- To review project progress against the Master schedule
- To coordinate interfaces between Contractor and existing facilities.
- Any other important issues.

5.6.2 Project kick off meeting

A project kick off meeting shall be organised by the Contractor after Contract award. The Contractor shall participate in the project kick-off workshop with project stakeholders designated by Employer. The kick-off workshop shall accomplish the following objectives:

- Common understanding of the project goals and objectives
- Define respective roles and responsibilities and
- Agree on the methods of communication and reporting throughout the project duration

5.6.3 Progress Meetings

The Contractor shall participate in monthly project status review meetings conducted by the Employer and present the project progress update in the meeting. The frequency of project status review meetings may change based on actual requirements.

This meeting shall be held in at a predetermined place, day, and time. The agenda for the schedule meeting shall be as follows:

- Review of baseline schedule.

- To review progress against the Master schedule and weekly look ahead schedules, discuss potential impacts and delays, including ways to mitigate the impacts and expedite the work reflecting through a schedule recovery plan.
- Review of project milestone
- Review of SH&E aspects
- Review of Quality issues
- Review of maintenance of site establishments including construction worker housing

5.6.4 Minutes

Minutes shall be prepared and submitted by the Contractor within 3 working days in draft form and shall be circulated to Employer and Employer's Engineer for their comments. Contractor shall incorporate the comments given by Employer and Employer's Engineer and minutes shall be furnished to attendees.

5.7 Progress Monitoring and Reporting Plan

5.7.1 Schedule Management

The Employer and Employer's Engineer shall monitor the Contractor's construction schedule. The Contractor shall submit a Level 3 schedule that covers the full scope of Contractor's work within 30 calendar days of date of appointment. This shall be reviewed within 15 calendar days by Employer / Employer's authorized representative. The Contractor shall incorporate the comments and resubmit the schedule no later than 15 calendar days after receiving the comments from Employer/ Employer's authorized representative. Upon approval the level 3 schedule will become the baseline schedule for all the future monitoring and tracking.

The Project Construction Manager, Project Controls Manager and Employer's Engineer shall perform meeting with the Contractor's representatives to review the physical progress against the base line schedule. This shall include the following:

- i. Compliance with the specified format.
- ii. Construction start, completion, and milestone dates.
- iii. Resource allocation for each activity.
- iv. Interface requirements.
- v. Unusually long or short durations.

- vi. Inconsistency in activity duration for similar items of work.
- vii. Sequences of activities.

The Contractor should keep to the following guidelines

- Develop and incorporate a detailed Work Breakdown Structure (WBS) for all project schedules that are submitted.
- All schedules shall be created, maintained and submitted to Employer / Employer's authorized representative in the latest version of Oracle Primavera P6 or equivalent in an electronic format.
- All schedules shall follow the Critical Path Method (CPM) of scheduling and shall have meaningful and realistic logical ties and relationships between activities.
- The use of negative lags is not permitted in the baseline and all other versions of the schedule.
- The schedule must contain all the long lead procurement items identified.
- Shall exercise reasonableness while assigning constraints in schedule and milestones
- Upon approval, the copy of the Baseline schedule will become the first Current Schedule.
- The Current schedule shall be actively updated and maintained by the Contractor every month.
- The updated Primavera P6 or equivalent schedule file should be submitted every month along with Monthly progress report in electronic format. A pdf copy of the updated schedule with all activities also needs to be submitted
- A schedule narrative document shall accompany the updated electronic schedule describing the work performed in the reporting period.
- The contractor should also submit a level 4 schedule within 60 calendar days from approval of baseline level 3 schedules.
- In the level 4 schedule activity durations should be reasonable (typically no more than 15 days duration except for project management tasks, procurement activities for long lead items or any other activity that obviously needs to be of longer duration).

5.7.2 Monthly Progress Report

The Contractor shall prepare and submit the Monthly Progress Report (standard format and template shall be provided by Employer at a later date). The Monthly Progress Report shall summarize the condition of all the projects. The Contractor shall also prepare, maintain and update the following as a part of monthly progress report:

- **Cash Flow:** The Contractor shall prepare project cash flow at the start of the project. Prepare monthly statements to show the actual versus plan spending; update the cost periodically
- **Lessons Learned Database:** The Contractor shall develop and actively maintain a “lessons learned” database on a monthly basis (to be included in the monthly project report) and submit it to Employer/ Employer’s authorized representative at the end of the project during closeout.
- **Risk Register:** Maintain an active risk register addressing the risks and mitigation measures (could be in excel format) that lists the project risks related to their Scope of Work.
- **Inter-Project Links:** Identify potential inter-project links, inter-dependencies or conflicts/interference to work or work areas and narrate them in the monthly progress report.

The Contractor shall take into notice that monthly payments are subject to timely submission of monthly progress report and the monthly updated electronic schedule file in the required and acceptable format.

5.8 Site Logistic Plan

Objective : Objective of the Site Logistic Plan is to determine the guideline for the Contractors working in DSIR projects to develop the most efficient means and methods for moving personnel, equipment and materials to the construction site, how they will be stored and secured prior to construction, constructing temporary utilities, site safety and security, and location of temporary construction facilities such as site offices, construction worker housing, store, plant & machinery workshop etc.

5.8.1 Temporary Facilities within the Work Area

The Contractor shall be responsible for the provision of temporary support facilities and Security and Protection Facilities within his Work Area for his worker and personnel and for all the personnel of the Project Consultants.

In addition to specific responsibilities for temporary facilities and controls thereof, the Contractor is responsible for the Installation, Operation, Maintenance and removal of each temporary facility within the work area and costs and use charges associated with each utility and facility.

In general, the Contractor shall comply with the SH&E Manual for all matters concerning safety, health and environment. The following conditions are particularly highlighted without being exhaustive and shall apply to the use of temporary facilities by all parties engaged in the Contract Works:

- House Keeping for keeping the site establishments neat and clean. Carry out progress cleaning of the work area on a daily basis.
- Operate in a safe and efficient manner.
- Do not permit any unauthorized parties to interfere with Temporary Utilities and Facilities.
- Take appropriate action on accident prevention and other safety measures.
- Do not allow hazardous, dangerous or unsanitary conditions or public nuisance to develop or persist in the work area.

5.8.2 Temporary Utilities

The Temporary Utilities that include, but are not limited to the following:

5.8.3 Site approach road network

Contractor working in DSIR shall construct site approaches for man power and machinery movement and transportation of materials to their work area as per the contract conditions. The approach road network shall cover site office, staff quarters, labour quarter, store, plant areas etc. The approach road network shall be maintained by the contractor throughout the construction period.

5.8.4 Traffic Management

Contractor shall control the Traffic Management by designated site staff.

5.8.5 Access and Egress

Access and egress routes for construction personnel, visitors and delivery vehicles shall be tentatively developed by the Contractor to suit acknowledged constraints and conditions. The vehicles shall be parked in the designated area only. Parking for site operatives must be organised by the Main Contractor to ensure that there is no inconvenience to local residents. Car parking will not be permitted on work site.

5.8.6 Visitor Control

Casual visitors to the site shall be discouraged due to safety considerations. All visits shall be scheduled and arranged through the Employer's office. The Employer office shall inform the Contractor of scheduled visits or tours.

The Contractor shall maintain a visitor register, and visitors shall be required to sign the register and wear an I.D. badge. The Contractor shall ensure that visitors wear appropriate safety equipment during their visit. The visitor may not be allowed without adequate PPE.

5.8.7 Site office

Contractor shall develop and maintain site office at suitable location by using recyclable materials. The office shall contain minimum facilities like project manager's cabin, planning department, staff room, safety officer room, time keeper room, record room, conference room etc. There shall be adequate space for parking of vehicles outside office.

5.8.8 Store, Plant and Machinery yard

Contractor shall develop and maintain facilities like store, plant and machinery yard etc. using recyclable material. Facilities like, reinforcement yard, shuttering materials, construction equipment like excavators, dumpers, dozers, graders, vibro rollers, compactors, transit mixers, concrete pumps, mixer machines etc. & other miscellaneous materials shall be kept in this area with adequate signage & proper housekeeping shall be maintained. The material stacking yard shall be properly barricaded by the contractor. The waste generated during maintenance shall be properly disposed on a regular basis.

5.8.9 Site laboratory

Site laboratory for testing of all construction material shall be developed by all agencies working in DSIR. The laboratory shall have all the equipment in good working condition with proper calibration as required for conducting tests at site. Internal testing spaces within the laboratory should be properly demarked. The laboratory shall be kept clean at all times.

5.8.10 Construction worker housing

Contractor shall develop and maintain construction worker housing including facilities like canteens, provision store, barber shop, kids play area, medical dispensary etc. Separate rooms shall be provided for women employees. The rest room shall be constructed so as to afford adequate protection against heat, wind, rain. It shall be made of prefabricated sheets, and shall have smooth, hard and impervious floor surface. It shall be made with the supported M.S. Structure like

column, truss / portal truss, purlin, tie member etc. shall be made out with suitable size rolled / tube / folded sections. The structure shall be painted with one coat of red oxide as primer and two coats of good quality oil paint. The insulated walls shall be made of Sandwich panels. The sandwich panels shall be made out of pre coated steel sheet on both side of PUF (Polyurethane foam). Contractor shall develop and maintain proper water supply network, sewage disposal network, storm water evacuation network, electricity supply network for all establishment etc. Proper housekeeping shall be maintained by the contractor at all times.

5.8.11 Supervision

The Contractor shall enforce strict discipline in use of temporary support facilities. To minimize waste and abuse, the Contractor shall limit the availability of temporary facilities to essential and intended uses.

5.8.12 Maintenance

The Contractor shall maintain the facilities in good operating condition until removal. It shall be protected from damage caused by extreme temperatures and similar elements.

5.8.13 Termination and Removal

The Contractor shall remove these facilities upon completion of work; however some facilities shall be retained to provide adequate support facilities to accommodate personnel remaining in the Work Area during the Defects Liability Period. After the defect liability / operation and maintenance period is over, the contractor shall remove the temporary facilities and vacate the area leaving it clean.

5.8.14 Temporary Dewatering Facilities and Drains

The Contractor shall apply temporary drainage and dewatering facilities and dispose rainwater in a manner that shall not result in flooding neither of the work area or endanger the Permanent Contract Works or the Temporary Support Facilities. The Contractor shall provide temporary ditches, drains and sumps necessary for draining the Work Area from storm water.

5.8.15 Temporary Signs

The Contractor shall provide sign boards mentioning work area or temporary facility area. These signboards shall be properly displayed in appropriate locations. The sign board shall be prepared by experienced signboard manufacturer. It shall contain the description in English, Hindi and local language. It shall also contain relevant and appropriate graphics.

6.0 Safety, Health & Environment (SH&E) Management Plan

6.1 Objective

Objective of this document is to define the principal requirements of the Employer on Safety, Health and Environment (SH&E) associated with the contractor / sub-contractor and any other agency to be practiced during mobilization, unloading, transportation, assembly/erection/construction, testing and commissioning of systems and all other allied works towards the execution of various projects in DSIR. The objective of these guidelines is to ensure that adequate precautions are taken to avoid accidents, occupational health and harmful effects on the environment during any operation in DSIR projects.

6.2 Application of this document

This document applies to all aspects of the contractor's scope of work, including all aspects conducted by sub-contractors and all other agencies. There shall be no activity associated to the contract carried out in under DSIR project, which is exempted from the purview of this document.

This document:

- Describes the SH&E interfaces between Employer and the Contractor.
- Details the processes by which the Contractor shall manage SH&E issues while carrying out the work under the contract.
- Describes by reference, the practices and procedures as given in the COMPANY Project Safety, Health & Environment manual for best SH&E performance.

These requirements shall be read in conjunction with Employer Project SH&E Manual, OHSAS 18001-1999, Occupational Health and Safety Management System and ISO 14001: 2004 Environmental Management Systems. The contractor shall define key terms used in these requirements related to OHSAS 18001 and ISO 14001 standards in their Project SH&E Manual.

6.3 'SH&E' Targets and Goals

The SH&E targets, goals and aim for the Works are to achieve:

- Zero total recordable injuries.
- Zero reportable environmental incidents.
- All personnel inducted in accordance with the approved contractor SH&E plan.

- Total compliance of conducting inspections and audits as per approved SH&E plan.
- 100% incident recording and reporting.
- 100% adherence of usage of appropriate PPEs at work.
- Executing construction work with least disturbance to the environment, adjoining road users and traffic.

6.4 SH&E Compliance

6.4.1 Memorandum of Understanding (MOU)

A Memorandum of Understanding placed at **Appendix No.: 1** shall be signed before the award of contract by the contractor with regard to various provisions on Safety, Health and Environment to be practiced during the works carried out in DSIR.

6.4.2 Employer's SH&E Policy and Management Systems

The construction works shall be undertaken in accordance with Employer's SH&E Policy and Management Systems as amended from time to time provided in Project.

7.0 SH&E Manual

7.1 Indian statutory requirements

7.1.1 Primary statutory regulations

- Contractor shall develop thorough understanding about the required legal requirements and compliances on safety, health and environment in general and Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996, Central Rules 1998, Building and Other Construction Workers' Welfare Cess Act, 1996 and Central Rules, 1998 in particular, not only to satisfy the Inspectors' perspective but the use of legislation as the strong tool for effective SH&E management at construction worksites. Contractor is strongly advised to practice the principle of voluntary compliance.
- In order to facilitate the contractor for better understanding on the various provisions of the above Act and Rules, a tabulated information highlighting the Sections/Rules referring to the corresponding registration of contractors, maintenance of registers and records, hours of work and wages, welfare, medical facilities and safety requirements are given in the document. It is an indicative one and not a limiting list.

- In addition, the works shall be undertaken in accordance with all applicable legislation and Indian statutory requirements listed below but not limiting to:
 - i. Indian Electricity Act 2003 and Rules 1956.
 - ii. Factories Act, 1948, Central Rules and Gujarat State Factories Rules.
 - iii. Motor Vehicles Act as amended in 1994 and The Central Motor Vehicles Rules, 1989, and – Gujarat State Motor Vehicles Rules as amended from time to time.
 - iv. The Petroleum Act, 1934 and Rules 1976.
 - v. Gas Cylinder Rules, 2003.
 - vi. Indian Explosives Act. 1884, along with the Explosives substance Act 1908 and the Explosives Rules 1983.
 - vii. The (Indian) Boilers Act, 1923.
 - viii. The Public Liability Insurance Act 1991 and Rules 1991.
 - ix. Minimum Wages Act, 1948 and Rules 1950.
 - x. Contract Labour Act, 1970 and Rules 1971.
 - xi. Child Labour (Prohibitions & Regulations) Act, 1986 and Rules 1950.
 - xii. Environment Protection Act, 1986 and Rules 1986.
 - xiii. Air (Prevention and control of Pollution) Act, 1981.
 - xiv. Water (Prevention and Control of Pollution) Act, 1974.
 - xv. The Noise Pollution (Regulation & Control) Rules, 2000.
 - xvi. Notification on Control of Noise from Diesel Generator (DG) sets, 2002.
 - xvii. Recycled Plastic Usage Rules, 1998.
 - xviii. Manufacture, Storage & Import of Hazardous Chemicals Rules, 1989.
 - xix. The Hazardous Waste (Management & Handling) Rules, 1989.
 - xx. Hazardous Waste Management Rules 1989 (as amended in 1999).

xxi. Batteries (Management and Handling) Rules.

7.1.2 Workman Compensation Act, 1923 along with allied Rules

- The contractor shall ensure that all his employees / workmen are covered under 'Workmen Compensation Act' and shall pay compensation to his workmen as and when the eventuality for the same arises.
- Notwithstanding the above Act/Rules, there is nothing in those to exempt the contractor from the purview of any other Act or Rule in Republic of India for the safety of men and materials.
- If the requirements stated in this document are less stringent than or in conflict with the country's applicable legislation, the latter shall apply.

7.2 International Standards, Guidelines & ISO Certifications

The works should be undertaken in accordance with the applicable international guidelines, standards and specifications on SH&E and every contract shall aim to achieve international certifications listed below during the currency of the contract:

- OHSAS 18001-1999: Occupational Health and Safety Management System.
- ISO 14001-2004: Environmental Management Systems.

The process of certification shall start immediately after the award of the work and complete within reasonable minimum time. Towards this, the contractor shall undertake the required steps for obtaining the certification on Occupational Health and Safety Management System and Environment Management System.

In case of contractors along with the joint venture partners, who possess a valid certification of either ISO 14001 or OHSAS 18001 or both shall include COMPANY contract in their immediate following surveillance audit which normally takes place once in 6 months from the date of certification and conduct the audit. The required documentation shall be undertaken with the help of the ISO consultant. If the same can be done in-house the same shall be demonstrated to the Employer. If any of the JV partners do not possess the ISO 14001 or OHSAS 18001 certification then the COMPANY contract shall obtain a fresh certification.

In case of failure on the part of the contractor, the Employer at the cost of the contractor shall do the same.

8.0 Risk Assessment and Method Statements

Risk Assessment shall be conducted by the contractor for all works to decide on priorities and to set objectives for eliminating hazards and reducing risks.

8.1 The Risk Assessment Process

The following elements shall be considered during the assessment process, but not limited to:

- i. hazard identification
- ii. persons at risk
- iii. evaluation of risk level
- iv. risk controls (existing and additional)
- v. record of risk assessment findings
- vi. monitoring and review

8.1.1 Hazard Identification

A critical observation/study of the structure/process/site under consideration by the risk assessment team is an essential part of hazard identification as is consultation with the relevant section of the workforce. It is important that unsafe conditions are not confused with hazards, during hazard identification.

8.1.2 Person(s) at Risk

On a construction/erecting/fabrication area, the persons at risk could be site operatives, surveyors, transport drivers, other visitors and the general public. The risk assessment must include any additional controls required due to the vulnerability of any of these groups, perhaps caused by inexperience or disability.

8.1.3 Evaluation of Risk Level

The purpose of the risk assessment, therefore, is to reduce the remaining risk after taking into consideration of risks already addressed. This is called the residual risk.

The goal of risk assessment is to reduce all residual risks to as low a level as reasonably practicable. In a relatively complex workplace, this shall take time so that a system of ranking risk is required – the higher the risk level the sooner it must be addressed and controlled. For most situations, a qualitative risk assessment shall be perfectly adequate. For all high risk activities a quantitative risk assessment shall be conducted to quantify the risk level in terms of the likelihood of an incident and its subsequent severity. Clearly the higher the likelihood and severity, the higher the risk will be. The likelihood depends on such factors as the control measures in place, the frequency the exposure to the hazard and the category of person exposed to the

hazard. The severity will depend on the magnitude of the hazard (e.g. voltage, toxicity etc.).

8.1.4 Risk Control Measures

The next stage in the risk assessment is the control of the risk.

Hierarchy of Risk Control

- When assessing the adequacy of existing controls or introducing new controls, a hierarchy of risk controls should be considered. The principles are:
 - i. avoiding risks
 - ii. evaluating the risks which cannot be avoided
 - iii. combating the risks at source
 - iv. adapting the work to the individual, especially as regards the design of the workplace, the choice of work equipment and the choice of working and production methods, with a view, in particular, to alleviating monotonous work and work at a predetermined work – rate and to reducing their effects on health
 - v. adapting to technical progress
 - vi. replacing the dangerous by the non-dangerous or the less dangerous
 - vii. developing a coherent overall prevention policy which covers technology, organization of work, working conditions, social relationships and the influence of factors relating to the working environment
 - viii. giving collective protective measures priority over individual protective measures and
 - ix. giving appropriate instruction to employees.
- In addition to the above the following principles shall also to be employed:
 - i. eliminating
 - ii. substitution
 - iii. engineering controls (e.g. isolation, insulation and ventilation)
 - iv. reduced or limited time exposure

- v. good housekeeping
- vi. safe systems of work
 - a) Method Statement
 - b) Permit to work
 - i. training and information
 - ii. personal protective equipment
 - iii. welfare
 - iv. monitoring and supervision
 - v. reviews

Method Statement

- The method statement should take into account the conclusions of risk assessments made under the Management, Control of Substances Hazardous to Health and the Manual Handling Operations Regulations.
- As a mandatory rule, if potentially hazardous activities are to be undertaken then method statements should be prepared.
- Typical work which shall require method statements includes:
 - i. work at height
 - ii. work in deep excavation
 - iii. erection and dismantling of scaffolding, temporary support systems, form work and false work
 - iv. refurbishment work, which may affect the structural stability of such a structure
 - a) roof work
 - b) erection of structures
 - c) work on high voltage electrical equipment
 - d) entry into confined spaces

- e) hot work
- f) work involving highly flammable liquids
- The extent and detail of a method statement shall depend upon the project components, size and / or complexity of the work, activity or task to be undertaken. A method statement should contain the following:
 - i. management arrangements, including identified persons with authority
 - ii. detailed sequence of work operations in a chronological order
 - iii. drawings and / or technical information
 - iv. detailed information on plant, equipment, substances etc.
 - v. inspection and monitoring controls
 - vi. risk assessments
 - vii. emergency procedures and systems
 - viii. arrangements for delivery, stacking, storing and movement of logistics on site
 - ix. details of site features, layout and access, which may affect the method of working
 - x. procedures for changing or departing from the method statement.
- The method statement is a dynamic document and must be adhered to and kept up to date.

8.1.5 Record of Risk Assessment Findings

- All risk assessment statements are to be recorded and maintained. The record should be accessible to auditors and employer's representative and a copy kept with the safety manual containing the safety policy and arrangements.

8.1.6 Monitoring and Review

- Risk controls shall be reviewed periodically. Review and revision shall be necessary when conditions change as a result of the introduction of new machinery, processes or hazards. There could also be changes in the workforce, for example, the introduction of trainees. The risk assessment only needs to be

revised if significant changes have taken place since the last assessment was done. An accident or incident or a series of minor ones provides a good reason for a review of the risk assessment. This is known as the post-accident risk assessment.

9.0 Contractor's SH&E Policy and Plan

The Contractor shall formulate a project specific SH&E policy and display it at conspicuous places at work sites in Hindi, English and a local language understood by the majority of construction workers. The general requirements for SH&E plan are:

The Contractor shall:

- a) Create and maintain a safe and health work environment
- b) Execute the works in a manner that complies with all the requirements of the Act and all the associated regulations, and in so doing, minimize the risk of incidents occurring; and
- c) Respond to the notices issued by the Employer's SH&E personnel

Within 4 weeks of the notification of acceptance of the tender, the Contractor shall submit a detailed and comprehensive Contract specific SH&E Plan. The SH&E Plan shall include detailed policies, procedures and regulations which, when implemented, shall ensure compliance of the contract provisions. The SH&E Plan shall include the following but not be restricted to:

9.1 A statement of the Contractor's policy, organisation and arrangements for SH&E

- The name(s) and experience of person(s) within the Contractor's proposed management who shall be responsible for co-ordinating and monitoring the Contractor's SH&E performance;
- The number of SH&E staff who shall be employed on the Works, their responsibilities, authority and line of communication with the proposed Contractor's agent;
- A statement of the Contractor's policy and procedures for identifying and estimating hazards, and the measures for addressing the same;
- A list of SH&E hazards anticipated for this Contract and sufficient information to demonstrate the Contractor's proposals for achieving effective and efficient health and safety procedures;
- A description of the SH&E training courses and emergency drills which shall be provided by the Contractor, with an outline of the syllabus to be followed;

- Details of the safety equipment which shall be provided by the Contractor, including personal protective equipment;
- A statement of the Contractor's policy and procedures for ensuring that Contractor's Equipment used on the Project Site are maintained in a safe condition and are operated in a safe manner;
- A statement of the Contractor's policy and procedures for ensuring that sub-contractors comply with the Contractor's safety plan;
- A statement of the Contractor's disciplinary procedures with respect to SH&E related matters, and
- A statement of the Contractor's procedure for reporting and investigating accidents, dangerous occurrences or occupational illnesses

9.2 Supplements to the SH&E Plan

The Contractor shall, from time to time and as necessary, is required by the Employer to produce supplements to the SH&E Plan such that it is at all times a detailed, comprehensive and contemporaneous statement by the Contractor of his site safety, industrial health and environment obligations, responsibilities, policies and procedures relating to work on Site. Any and all submissions of supplements to the SH&E Plan shall be made to the Employer in accordance with the agreed procedures.

9.3 Revision of SH&E Plan

If at any time the SH&E plan is, in the Employer's opinion, requires revision or modification to ensure the security of the Works and the safety of all workmen upon and visitors to the Site, the Employer may instruct the Contractor to revise the SH&E plan and the Contractor shall within 7 days submit the revised plan to the Employer for review and approval.

9.4 Omissions, Inconsistencies and Errors in the SH&E Plan

Any omissions, inconsistencies and errors in the SH&E Plan or the Employer's acceptance or rejection of the SH&E Plan and/or supplements thereto shall be without prejudice to the Contractor's obligations with respect to site safety, industrial health and environment and shall not excuse any failure by the contractor to adopt proper and recognised safety practices throughout the execution of the Work.

9.5 Adherence to SH&E Plan

The Contractor shall adhere to the SH&E Plan and shall ensure, as far as practically possible, that all sub-contractors of all tiers require that contracting parties each have a copy of the Site SH&E Plan and comply with its provisions.

9.6 Health and Safety in Contractor's Design Deliverables

When considering health and safety in designer's work, they shall be expected to do what is reasonable at the time the design is prepared. It may be possible for hazards, which cannot be addressed at the feasibility stage to be looked at during detailed design. In deciding what is reasonably practicable, the risk to health and safety produced by a feature of the design has to be weighed against the cost of excluding the feature. The overall design process does not need to be dominated by a concern to avoid all risks during the construction phase and maintenance. However, a judgment has to be made by weighing up one consideration against another so the cost is counted not just in financial terms, but also those of fitness for purpose, aesthetics, constructability or environmental impact. By applying these principles, it may be possible to make decisions at the design stage, which shall avoid or reduce risks during construction work. In many cases, the large number of design considerations shall allow a number of equally valid design solutions. What is important is the approach to the solutions of design problems. This should involve a proper exercise of judgment, which takes account of health and safety issues. The contractor shall appoint a Safety Consultant at the start of the contract and to implement the consultant's directions in respect of safety.

9.7 Hierarchy of Risk Control

Designers shall need, so far as reasonably practicable, to avoid or reduce risks by applying a series of steps known as the hierarchy of risk control or principles of prevention and protection. The steps to be adopted shall include the following:

- consider if the hazard can be prevented from arising so that the risk can be avoided (e.g., alter the design to avoid the risk);
- if this cannot be achieved, the risk should be combated at source (e.g., ensure the design details of items to be lifted include attachment points for lifting);
- failing this, priority should be given to measures to control the risk that shall protect all people;
- only as a last resort should measures to control risk by means of personal protection be assumed (e.g., use of safety harnesses).

In case of situations where the designers have carried out the design work and concluded that there are risks, which were not reasonably practicable to avoid,

detailed information shall be given about the health and safety risks, which remain. This information needs to be included with the design to alert others to the risks, which they cannot reasonably be expected to know. This is essential for the parties who have to use the design information.

If the designers' basic design assumptions affect health or safety, or health and safety risks are not obvious from the standard design document, the designer shall provide additional information. The information shall include a broad indication of the assumptions about the precautions for dealing with the risks. The information shall need to be conveyed in a clear manner; it shall be included on drawings, in written specifications or outline method statements. The level of detail to be recorded shall be determined by the nature of the hazards involved and the associated level of risk.

9.8 Employer's approval

Every structure like scaffold, false work, etc. shall have its design calculations included in the method statements in addition to health and safety risks. Employers' designer or his approved proof check consultants as applicable as per the contract conditions shall approve all these designs.

Any non-standard structures like trestles made up of re-bars or structures which are very old, corroded, repaired for many times etc. for which no design calculations can be made accurately from any national standards, shall not be allowed to be used at sites even for short duration.

If any of the above mentioned clauses are not adhered penalty shall be imposed depending upon the gravity of the unsafe act and or condition.

10.0 Contractor SH&E Personnel and Responsibilities

10.1 Education and Experience

The Contractor shall appoint the required SH&E personnel as prescribed in General Instruction (enclosed at the end) based upon the statutory requirement and establishes the safety organisation based upon the contract value.

In order to effectively interact on labour welfare matters with the Employer and the statutory authorities enforcing the labour welfare legislations every contractor shall employ a duly qualified and experienced full time Labour Welfare Officer.

Conduct and competency

The conduct and functioning of the Contractor SH&E personnel shall be monitored by the Employer. Any default or deficiency shall attract penalty as per details given under penalty clause of this document.

The Contractor shall ensure that all personnel are competent to perform the job assigned to them. In the event that the Contractor is unable to demonstrate the competency of any person whose activities can directly impact on the Works' SH&E performance, the Employer shall remove that person from the site without any procedural formalities.

10.2 Approval from Employer

The name, address, educational qualification, work experience and health condition of each personnel deployed for SH&E jobs shall be submitted to the Employer in the format prescribed for the purpose for comments and approval well before the start of the work. Only on approval by the Employer these personnel are authorised to work. In case any of the SH&E personnel leaves the contractor the same shall be intimated to the Employer. The contractor shall recruit new personnel and fill up the vacancy.

10.3 Responsibility of SH&E personnel

For all works carried out by the contractor and his sub-contractors, the responsibility of ensuring the required SH&E manpower lies with the main contractor only. The minimum required manpower indicated by the Employer includes the sub-contractors' work also. It shall be the responsibility of the main contractor to provide required SH&E manpower for all the works executed by all contractors. Necessary conditions shall be included in all sub-contract documents executed by the main contractor.

The Contractor shall appoint in writing one health and safety representative for every 50 employees working on the site.

10.4 Employment status of SH&E personnel

No Contractor shall engage SH&E manpower from any outsourcing agencies in which case the effectiveness would be lost. All SH&E manpower shall be on the payroll of the main contractor only and not on the payroll of any subcontractor or outsourcing manpower agencies etc. This condition does not apply to positions like traffic marshals who are engaged almost on a daily requirement basis.

10.5 Reporting of SH&E personnel

All SH&E personnel shall report directly to the Project Manager. The Employer shall monitor adherence to this procedure at all times. In case of non-adherence penalty shall be levied as indicated in the penalty clause.

10.6 Inadequate SH&E personnel

In case if the Contractor fail to provide the minimum required manpower as illustrated in General Instruction or fail to fill up vacancies created within 14 days, the same shall be provided by the Employer at Contractor's cost. Any administrative expenses involved providing the same like paper advertisement or manpower consultant charges, etc. shall also be at the cost of contractor.

10.7 Prohibition of performance of other duties

No SH&E personnel shall be required or permitted to do any work which is unconnected to, inconsistent with or detrimental to the performance of the SH&E duties for respective category mentioned in General Information.

The Contractor shall provide all SH&E personnel with such facilities, equipment and information that are necessary to enable him to dispatch his duties effectively.

The minimum Employer's requirements of such facilities / equipment to be provided for SH&E personnel are given in the General Instruction.

11.0 Contractor SH&E Committee

11.1 SH&E Committees

All employees should be able to participate in the making and monitoring of arrangements for safety, industrial health and environment at their place of work. The establishment of site SH&E committees in which Contractors employees and Contractor and sub-contractor management are represented can increase the involvement and commitment of employees. Safety committee shall also include minimum one person from Employer's Engineer. The Contractor shall ensure the formation and monitor the functioning of Contractor SH&E committees.

11.2 Terms of Reference

The Terms of Reference for the committee shall be as follows;

- To establish company safety policy and practices
 - i. To monitor the adequacy of the Contractor's site SH&E plan and ensure its implementation.
 - ii. To review SH&E training.
 - iii. To review the contractor's monthly SH&E report.

- iv. To identify probable causes of accident and unsafe practices in building or other construction work and to suggest remedial measures.
 - v. To stimulate interest of Employer and building workers in safety by organizing safety week, safety competition, talks and film-shows on safety, preparing posters or taking similar other measures as and when required or as necessary.
 - vi. To go round the construction site with a view to check unsafe practices and detect unsafe conditions and to recommend remedial measures for their rectifications including first-aid medical and welfare facilities.
 - vii. Committee team members should perform a site inspection before every committee meetings and to monitor SH&E inspection reports.
 - viii. To bring to the notice of the Employer the hazards associated with use, handling and maintenance of the equipment used during the course of building and other construction work.
 - ix. To suggest measures for improving welfare amenities in the construction site and other miscellaneous aspect of safety, health and welfare in building or other construction work.
 - x. To look into the health hazards associated with handling different types of explosives, chemicals and other construction materials and to suggest remedial measures including personal protective equipment.
- To review the last safety committee meeting minutes and to take action against persons/sub-contractors for non-compliance if any.

Within 14 days of award of contract, the SH&E committee shall be constituted and notification regarding the same shall be communicated to the members and employees as per the format provided during the kick-off meeting.

Site SH&E Committee meeting shall be conducted at least once in a month with the minimum members listed below:

Chairman	Project Manager
Secretary	SH&E Manager (In-charge)
Members	I. Construction Manager
	II. In charge of plant and machinery
	III. In charge of site electrics
	VI. Employer's Engineer representative
	VII. Employer representative

11.3 Minimum time between two monthly SH&E Committee meetings

A minimum period of 21 calendar days shall be maintained between any two SH&E monthly committee meetings.

11.4 Agenda

The Secretary shall circulate the agenda of the meeting at least seven working days in advance of the scheduled date of the meeting to all members.

The agenda should broadly cover the following:

- Confirmation of minutes.
- Chairman's review/overview of site SH&E performance / condition.
- Previous month SH&E statistics.
- Incident and Accident Investigation / dangerous occurrence / near miss report.
- Site SH&E inspection.
- Sub-contractors' SH&E issues.
- Safety presentation by Secretary.
- Report from Employer.
- Any other business.

11.5 Minutes of the meeting

The Minutes of the meeting shall be prepared as per the format provided at the time of the kick – off meeting. The MoM shall be sent to all members within 3 working days preferably by mail followed by hardcopy. Safety Committee meeting minutes shall also be displayed in the notice board for wider publicity to all concerned.

11.6 Disciplinary Action

The chairman shall inform the members of any outstanding issues in the meeting and in case of repeated offence/ non-compliance by some members or other co/sub-contractors and propose suitable disciplinary action including provisions of monetary penalty as per the relevant contract clauses, the Employer shall ensure that the same is implemented.

12.0 ID Card and First Day at Work, SH&E Orientation Training

The Contractor shall ensure that all personnel working at the site receive an induction SH&E training explaining the nature of the work, the hazards that may be encountered during the site work and the particular hazards attached to their own function within the operation.

All personnel shall be issued a photo identity card of size 85mm x 55mm duly signed by the safety officer or any authorized representative of the contractor before they are engaged for any work.

13.0 SH&E Training

The attitude of people at all levels of the contractor is critical for SH&E performance. The Contractor shall keep his workforce motivated and focused on practising the SH&E norms at all times.

The Contractor shall organise quality SH&E training to engage Managers, supervisors and other personnel in behavioural change and improve safety performance.

The Contractor shall analyse the training requirements for all the employees and initiate a training program to demonstrate that all persons employed, including subcontractors, are suitably qualified, competent and fit. This shall include:

- Detailed Job descriptions for all personnel, to include their specific SH&E responsibilities.
- Specification of qualifications, competency and training requirements for all personnel.
- Assessment and recording of training needs for all personnel, including subcontractors' employees in the workforce, vendor representatives and site visitors.
- A system for assessing new hirers' e.g. prior training and experience.
- A means of confirming that the system is effective.
- A matrix and schedule of training requirements, covering general, task– specific and SH&E-related training, showing the training frequency and interval between refresher courses.
- Timely, competent delivery of training courses.

The Contractor shall arrange behavioural-based training programmes for all the executives to identify recognise and eliminate unsafe act and unsafe conditions.

The refresher-training programme to all employees shall be conducted once in six months.

The employees completing the training program successfully shall be provided with a Safety Sticker. It is mandatory for all the employees to have Safety Sticker on their safety helmets. Any employee, who fails to abide by this, shall not be allowed to work on construction site. The SH&E manager shall monitor it on daily basis and maintain a register of employees violating this rule.

Toolbox talks shall be conducted by Contractors safety officers to all workmen every day before the start of every working day.

On-the spot practical skill development training on height safety including scaffold safety, crane safety, welding safety, electrical safety, and traffic safety for marshals shall also be conducted to all foremen/ workmen who were associated to the concerned jobs.

Daily Safety Oath as given in the Project SH&E manual shall be taken by every employee including workman.

All vehicle drivers shall be instructed for defensive driving by the Contractors safety manager. Contractor shall provide training if required.

In case of failure on the part of the contractor to provide all the above-mentioned training programs to all employees in time, the same shall be provided by the Employer through accredited agencies if required by formulating a common scheme to all contractors. It is mandatory for the contractors to participate in the common scheme. Any administrative expenses and training fee towards the same shall be at the cost of the contractor.

14.0 SH&E Inspection

The contractor shall evolve and administer a system of conducting SH&E inspections and other risk management analysis on a periodical basis.

The purpose of SH&E inspection is to identify any variation in construction activities and operations, machineries, plant and equipment and processes against the SH&E Plan and its supplementary procedures and programs.

Following SH&E inspections program shall be adopted.

- Planned General Inspection.
- Routine Inspection.
- Specific Inspection.

- Other Inspection.

14.1 Planned General Inspection

- Planned general inspections are performed at predetermined intervals and it usually involves the representation from both Contractor and the Employer.
- Inspections that shall be classified under this inspection program are:
 - i. Monthly contractor's site safety committee Inspection.
 - ii. Weekly safety inspection by construction supervisors (Contractors and Sub-contractors).
 - iii. Daily safety inspection by contractor site SH&E team.

14.2 Routine Inspection

- Routine inspections are often referring to the inspection of work site, equipment and temporary structures performed by site and equipment operators and temporary structure erectors.
- Inspections that shall be classified under this inspection program are:
 - i. Daily Inspection of site, plant and equipment (before the start of day)
 - ii. Weekly Inspection of scaffold
 - iii. Monthly Inspection of electrical hand tools by competent electrical supervisor
 - iv. Quarterly Inspection of temporary electrical systems by competent electrical supervisor
 - v. Half-yearly inspection of lifting machinery, lifting appliances and equipment etc. by competent person.
- The list mentioned above is not exhaustive. Contractor may add additional categories. Contractors' Site SH&E Manager shall ensure that a system of routine inspections are carried out periodically to all plants, equipment, powered tools and any other temporary structures that shall pose a hazard to operators and workmen.

14.3 Specific Inspection

- Specific inspections are performed on activities without a predetermined date. Competent supervisors usually perform inspections for ensuring an activity whether it is executed in accordance to a general set of rules; method statement submitted or developed procedures.
- The following are examples that shall be commonly performed as required on the construction site:
 - i. Inspection performed before and after the entry of person into a confined space.
 - ii. Inspection performed before starting earthwork by heavy equipments.
 - iii. Inspection performed before and after a welding and gas cutting operation.
 - iv. Inspection of formwork before concreting by formwork erector.
 - v. Inspection of areas, material, scaffold, equipment and such immediately after any abnormal weathering experienced on site
- The list mentioned above is not exhaustive. The contractor shall ensure that a competent supervisor inspects all high-risk processes and activities.

14.4 Other Inspection

Other inspections include the following:

- i. Mandatory Inspections by Labour Department of Government.
- ii. Inspection by Employer
- iii. Inspection by Contractor's Top Management

14.4.1 The contractor shall prepare all required safety inspection checklist for all activity operations and equipment. Checklists shall be prepared based on the Indian standards, rules and regulations and Employer's requirements. The formats shall be included in the contractor's Project SH&E manual.

14.4.2 All inspection records and reports shall be properly kept and filed for audit purpose. Inspection reports of Planned General Inspection and Routine Inspection shall be used for discussion during Safety Committee Meetings.

15.0 SH&E Audit

15.1 General

15.1.1 Purpose and scope of SH&E audit

The purpose and scope of SH&E audit is to assess potential risk, liabilities and the degree of compliance of construction Safety, Health & Environmental plan and its supplementary procedures and programs against applicable and current SH&E legislation regulations and requirements of the employer. Project Manager holds the ultimate responsibility in ensuring implementation of SH&E audit program during the assembly/erection/construction work.

15.1.2 Types of Audits

The following two types of audits are to be conducted by contractor.

- Audit Rating Score (A R S)
- Electrical Safety Audit (E S A)

15.1.3 Audit Rating Score (A R S)

Audit Rating Score (ARS) shall be performed once in six month. A team consisting of Project manager and Employer's representative based on the pre-designed score-rating format shall conduct it. This six monthly SH&E Audit Rating Score (ARS) report shall enable the Employer to evaluate the general compliance by the Contractor with the Conditions of Contract, the Employer's Project SH&E Manual and the Contractor's site specific SH&E Plan. Six Monthly Audits shall be conducted in accordance with Employer Guidelines. The Project Manager accompanied by the Employer's representatives shall carry out the Audit. The Contractor's senior manager and SH&E in-charge should also be invited to attend.

15.1.4 Timing

- The Audit Rating Score (ARS) should be conducted at least 7 days prior to the scheduled date of Monthly SH&E Committee meeting of the particular month.

15.1.5 Evaluation

- The numerical scoring has been weighed on a 1-10 scale. The audit team shall use their observations noted in evaluating the points to be awarded against each of the elements of the audited section. Wherever some topics and sub-topics are not applicable the score rating need not be given. The overall audit ratings shall be achieved by:

Overall Audit rating = $\frac{\text{Actual Score Achieved}}{\text{Maximum Possible Score}} \times 100$

Maximum Possible Score

- The criteria of the required actions for the respective sections of the Audit shall be classified as given in Table 1 below:

Table 1: Audit Rating – Action to be taken

Sr.	Score	Description	Action
1	< 60%	Immediate	Contractor to rectify within 24 hours
2	< 75%	Improvement Necessary	Contractor rectification within 7 days and confirmed in writing to Employer
3	< 90%	Improvement Desirable	Contractor rectification within one month and confirmed in writing to Employer

15.1.6 Report

- A copy of each Audit Report shall be sent to Employer, Employer's Engineer and to all subcontractors, with whom it shall then be discussed in detail at the Monthly SH&E Committee Meeting in order to ensure that any corrective actions are agreed upon.

15.1.7 Targets of SH&E Audit

- The contents and coverage of the external audit shall include the following items but not limited to:
 - i. SH&E Organization Management.
 - ii. Communication and Motivation.
 - iii. Emergency preparedness.
 - iv. Education and Training.
 - v. Construction operational safety.
 - vi. Electrical system safety.
 - vii. Safety Appliances.
 - viii. Fire prevention and control.
 - ix. Housekeeping.

- x. Maintenance and Machinery safety.
- xi. First-aid and Medical Facilities.
- xii. Environmental Management.

15.1.8 Audit Preparation

- Audit team members are required to gather information by observations through interviews and by checks of hardware and documentation.
- Audit team shall prepare checklist to cover all parts based on SH&E legislations rules and regulations.
- Audit team members shall verify the facts and findings leading to the identified gaps and weakness.
- Audit leader has overall responsibility for reaching a conclusion.

15.1.9 Reporting

- Audit report shall be prepared and sent to the Employer and Employer's Engineer within 5 working days of conducting the audit by the contractor.

15.1.10 Report contents

- Executive summary - based on the finalized checklists as written the findings to the Employer by the audit team members, the audit leader shall compile a concise and accurate summary of observations and findings.
- Introduction - this shall contain basic information regarding the facilities or organization audited, the specific audit dates (inclusion of those for preparation and post-audit activities).
- Principal positive findings - this shall contain the summary of positive aspects as observed by the auditors. It shall also contain highlights of those issue, which may warrant dissemination as best practice regarding methodology used or achievement.
- Audit Findings - All audit findings as detailed in the audit checklists shall be grouped together as priority 1 and 2 as detailed below in a separate listing.
 - i. Priority 1: Actions to rectify gaps or weakness should generally be implemented immediately, in no case beyond one-weeks' time, if risk potential is high or unacceptable.

- ii. Priority 2: Actions should be generally implemented or rectified with a maximum of 1 - 2 weeks, if not rectified would create a likelihood of minor injury or business loss.

15.1.11 Conformity Report & Action by Employer

- The auditor shall inspect the site after 7 days of conducting initial audit for checking the adequacy of implementation of items maintained under priority 1 by the contractor and shall submit a conformity / non-conformity report to the Employer with a copy to the contractor.
- The auditor shall again inspect after 14 days of conducting initial audit for checking the adequacy of implementation of items mentioned under priority 2 by the contractor and shall submit a conformity / non-conformity report to the Employer with a copy to the contractor.
- In case of non-conformity of items mentioned by auditor, the Employer shall take necessary steps including stoppage of work and or imposing any penalty for getting the item implemented.

16.0 SH&E Communication

16.1 Safety Communication

The Contractor shall take every effort to communicate the Safety, Occupational health and Environment management measures through posters campaigns / billboards / banners / glow signs being displayed around the work site as part of the effort to raise safety awareness amongst to the work force. Posters should be in Hindi, English and Local language deemed appropriate. Posters / billboards / banners/ glow signs should be changed at least once in a month to maintain the impact. The contractor shall also observe important days as listed.

16.1.1 SH&E Submittals to the Employer

- The contractor's SH&E management should send the following reports to the Employer periodically:
 - i. Daily Reporting of total no of workmen.
 - ii. Monthly SH&E Report.
 - iii. SH&E Committee Meeting Minutes.
 - iv. SH&E Inspection Reports.
 - v. SH&E Audit Reports.

16.1.2 Daily Reporting of total no of workmen

The Contractor shall report to the Employer the total no. of workmen engaged by all including any subcontractor within 2 hours of starting of any shift in any day. This reporting shall be the primary duty of the Chief SH&E Manager of the contractor and reporting shall be through tele-fax / email. The onus of checking the receipt of the same by the Employer lies with the contractor. If the information is not received or received more than 2 hrs after starting of the shift, penalty shall be levied as per relevant clause.

16.2 Monthly SH&E Report

The Contractor shall prepare a monthly SH&E report consisting of the following and submit 3 copies within 7th of next month to the Employer as specified in the Project SH&E manual.

- Monthly man-hour details as specified in the Project SH&E manual.
- Monthly accident / incident details as specified in the Project SH&E manual.
- SH&E committee details.
- Details of SH&E training conducted in the month.
- SH&E Inspection.
- SH&E Communication activities under taken in the month indicating the number of posters displayed and balance availability in stock.
- Toolbox talks details.
- Housekeeping.
- Health and Welfare activities.
- SH&E Activities Planned for next month.

16.3 Accident Reporting and Investigation

16.3.1 Reporting to Employer

- All accidents and dangerous occurrences shall immediately be informed verbally to the Employer. This shall enable the Employer to reach to the scene of accident / dangerous occurrences to monitor/assist any rescue work and/or start conducting the investigation process so that the evidences are not lost.

- Reports of all accidents and dangerous occurrences shall also be sent within 24 hours as per format provided in the Employer's Project SH&E manual.
- No accident / dangerous occurrence should be exempted from reporting to the Employer.
- Any wilful delay in verbal and written reporting to the Employer shall be penalised as per relevant clause.

16.3.2 Reporting to Government organisations

In addition to the above verbal and written reporting to the Employer, notice of any accident to a worker at the building or construction site that:

- causes loss of life; or
- disables a worker from working for a period of 48 hours or more immediately following the accident;
- shall forthwith be sent by telegram, telephone, fax, or similar other means including special messenger within four hours in case of fatal accidents and 72 hours in case of other accidents, to:
 - a) the Regional Labour Commissioner , wherein the contractor has registered the firm/work;
 - b) the officer-in-charge of the nearest police station;
 - c) the next of kin or other relative of the worker involved in the accident.

In case of an accident causing minor injury, first-aid shall be administered and the injured worker shall be immediately transferred to a hospital or other place for medical treatment.

16.3.3 Reporting of dangerous occurrences

The following classes of dangerous occurrences shall be reported to the Inspector having jurisdiction, whether or not any disablement or death caused to the worker, namely:

- a) collapse or failure of lifting appliances, or hoist, or conveyors, or similar equipment for handling of construction material or breakage or failure of rope, chain or loose gears; or overturning of cranes used in construction work;
- b) falling of objects from height;

- c) collapse or subsidence of soil, pipe lines, any wall, floor, gallery, roof or any other part of any structure, platform, staging, scaffolding or means of access including formwork;
 - d) explosion of receiver or vessel used for storage of pressure greater than atmospheric pressure, of any gas or gases or any liquid or solid used as building material;
 - e) fire and explosion causing damage to any place on construction site where building workers are employed;
 - f) spillage or leakage of any hazardous substance and damage to their container;
 - g) collapse, toppling or collision of transport equipment;
 - h) leakage or release of harmful toxic gases at the construction site;
- In case of failure of lifting appliance, loose gear, hoist or building and other construction work, machinery and transport equipment at a construction site, such appliances, gear, hoist, machinery or equipment and the site of such occurrence shall, as far as practicable, be kept undisturbed until inspected by the Employer's representative;
 - Every notice given for fatal accidents or dangerous occurrences shall be followed by a written report to the concerned Authorities.

16.4 Accident investigation

16.4.1 General

- Investigations should be conducted in an open and positive atmosphere that encourages the witnesses to talk freely. The primary objective is to ascertain the facts with a view to prevent future and possibly more serious occurrences.
- Accidents and Dangerous Occurrences which result in death, serious injury or serious damage must be investigated by the Contractor immediately to find out the cause of the accident/occurrence so that measures can be formulated to prevent any recurrence.
- Near misses and minor accidents should also be investigated by the Contractor as soon as possible as they are signals that there are inadequacies in the safety management system.

16.4.2 Procedure of incident investigation

- It is important after any accident or dangerous occurrence that information relating to the incident is gathered in an organised way. The following steps shall be followed;
 - a) take photographs and make sketches.
 - b) examine involved equipment, material and the environmental conditions.
 - c) interview the injured, eye-witnesses and other involved parties.
 - d) consult expert opinion where necessary.
 - e) identify the specific contractor or sub-contractor involved.
- Having gathered information, it is then necessary to make an analysis of incident
 - a) establish the chain of events leading to the accident or incident.
 - b) find out at what stage the accident took place.
 - c) consider all possible causes and the interaction of different factors that led up to the accident, and identify the most probable cause. The cause of an accident should never be classified as carelessness. The specific act or omission that caused the accident must be identified.
- The next stage is to proceed with the follow-up action report on the findings and conclusions formulate preventive measures to avoid recurrence publicise the findings and the remedial actions taken.

16.5 Employers' independent incident investigation

In case of fatal / dangerous occurrence the Employer can also conduct independent investigation. Contractor and his staff shall extend necessary co-operation and testify about the accident.

The Contractor shall take every effort to preserve the scene of accident till the Employer completes the investigation.

All persons summoned by the Employer in connection to witness recording shall obey the instructions without delay. Any wilful suppression of information by any person shall be removed from the site immediately and / or punishable as per relevant penalty clause.

17.0 Emergency Response Plan

The Contractor shall prepare an Emergency Response Plan for all work sites as a part of the Contractor SH&E Plan. The plan shall integrate the emergency response plans of the Contractor and all other subcontractors. The Emergency Response Plan shall detail the Contractor's protocols and procedures, including detailed communications arrangements, for dealing with all emergencies that could affect the Site. This include where applicable, injury, sickness, evacuation, fire, chemical spillage, severe weather and rescue.

The Contractor shall ensure that an Emergency Response Plan is prepared to deal with emergencies arising out of:

- Fire and explosion.
- Collapse of lifting appliances and transport equipment.
- Collapse of building, sheds or structure etc.
- Gas leakage or spillage of dangerous goods or chemicals.
- Bomb threatening, criminal or terrorist attack.
- Earthquake, storms and other natural calamities.

Arrangements shall be made for emergency medical treatment and evacuation of the victim in the event of an accident or dangerous incident occurring, the chain of command and the responsible persons of the contractor with their telephone numbers and addresses for quick communication shall be adequately publicized and conspicuously displayed in the workplace.

Contractors shall require to tie-up with the hospitals and fire stations for attending to the casualties promptly and emergency vehicle kept on standby duty during the working hours for the purpose.

Contractor shall conduct an onsite emergency mock drill once in every month for all his workers and his subcontractor's workers.

It shall be the responsibility of the contractor to keep the Local Law & Order Authorities informed and seek urgent help, as the case may be, so as to mitigate the consequences of an emergency. Prompt communication to Employer, telephonically initially and followed by a written report, shall be made by the contractor.

18.0 Housekeeping

Housekeeping is the act of keeping the working environment cleared of all unnecessary waste, thereby providing a first-line of defence against accidents and injuries.

Contractor shall understand and accept that improper housekeeping is the primary hazard in any construction site and ensure that a high degree of housekeeping is always maintained. Indeed “Cleanliness is indeed next to Godliness”

Housekeeping is the responsibility of all site personnel, and line management commitment shall be demonstrated by the continued efforts of supervising staff towards this activity.

Adequate time shall be assigned to ensure that good housekeeping is maintained. This shall be carried out by team of housekeeping squad.

The contractor shall be responsible to provide segregated containers for disposal of debris at required places and regular cleaning of the same.

Full height fence, barriers, barricades etc. shall be erected around the site office establishments and construction worker housing in order to prevent the surrounding area from excavated soil, rubbish etc, which may cause inconvenience to and endanger the public. The barricade especially those exposed to public shall be aesthetically maintained by regular cleaning and painting as directed by the Employer. These shall be maintained in one line and level.

The structure dimension of the barricade, material and composition, its colour scheme, Employer’s logo and other details shall be in accordance with specifications laid down in tender document.

All stairways, passageways and gangways shall be maintained without any blockages or obstructions. All emergency exits passageways, exits fire doors, break-glass alarm points, firefighting equipment, first aid stations, and other emergency stations shall be kept clean, unobstructed and in good working order.

Lumber with protruding nails shall be either bent or removed and properly stacked. Un-packed wooden strips shall be safely stored and disposed.

All surplus earth and debris are removed/disposed off from the working areas to officially designated dumpsites. Trucks carrying sand, earth and any pulverized materials etc. in order to avoid dust or odour impact shall be covered while moving. The tyres of the trucks leaving the site shall be cleaned with water, wherever the possibility of spillage on carriageways meant for regular road traffic exists.

No parking of trucks/trolleys, cranes and trailers etc. shall be allowed on roads, which may obstruct the traffic movement.

Proper and safe stacking of material are of paramount importance at yards, stores and such locations where material would be unloaded for future use. The storage area shall be well laid out with easy access and material stored / stacked in an orderly and safe manner.

Flammable chemicals / compressed gas cylinders shall be safely stored.

Unused/surplus cables, steel items and steel scrap lying scattered at different places within the working areas shall be removed to the identified location(s).

All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from work place to the identified location(s).

Empty cement bags, if any and other packaging material shall be properly stacked and removed.

The Contractor shall ensure that all his sub-contractors maintain the site reasonably clean through provisions related to housekeeping.

19.0 Working at Height

19.1 Definitions

19.1.1 "access" and "egress" include ascent and descent.

19.1.2 "fragile surface" means a surface, which would be able to fail if any reasonably foreseeable loading were to be applied to it.

19.1.3 "line" includes rope, chain or webbing.

19.1.4 "personal fall protection" means:

- a fall prevention, work restraint, work positioning, fall arrest or rescue system, other than a system in which the only safeguards are collective safeguards; or
- rope access and positioning techniques.

19.1.5 "work at height" means:

- work in any place, including a place at or below ground level;
- obtaining access to or egress from such place while at work, except by a staircase in a permanent workplace;

- where, if protective measures were not taken, a person could fall a distance liable to cause personal injury.

19.1.6 "work equipment" means any machinery, appliance, apparatus, tool or installation for use at work (whether exclusively or not) and includes:

- a guard-rail, toe-board, barrier or similar collective means of protection;
- a working platform;
- a net, airbag or other collective safe guard for arresting falls;
- personal fall protection system;
- ladders.

19.1.7 "working platform"

- means any platform used as a place of work or as a means of access to or egress from a place of work;
- includes any scaffold, suspended scaffold, cradle, mobile platforms, trestle, gangway, gantry and stairway which is so used.

19.2 Organisation and planning

The contractor shall ensure that work at height is:

- properly planned for any emergencies and rescue;
- appropriately supervised; and
- carried out in a manner, which is reasonably practicable safe.

The Contractor shall ensure that work at height is carried out only when the weather conditions do not jeopardise the health or safety of persons involved in the work.

19.3 Competence

- The Contractor shall ensure that no person engages in any activity, including organization, planning and supervision, in relation to work at height or work equipment for use in such work unless he is competent to do so or, if being trained, is being supervised by a competent person.

19.4 Avoidance of risks from work at height

The Contractor shall ensure that work is not carried out at height where it is reasonably practicable to carry out the work safely otherwise than at height.

19.4.1 Where work is carried out at height, the Contractor shall take suitable and sufficient measures as given below to prevent, so far as is reasonably practicable, any person falling a distance liable to cause personal injury. This ensuring that the work is carried out:

- from an existing place of work; or
- in the case of obtaining access or egress using an existing means complying to the requirements;
- where it is reasonably practicable to carry it out safely and under appropriate ergonomic conditions; and
- where it is not reasonably practicable for the work to be carried out, his providing sufficient work equipment for preventing, so far as is reasonably practicable, a fall occurring.

19.5 Selection of 'work equipment' for work at height

- The Contractor, in selecting work equipment for use in work at height, shall
 - a) give collective protection measures priority over personal protection measures; and
 - b) take account of
 - i. the working conditions and the risks to the safety of persons at the place where the work equipment is to be used;
 - ii. in the case of work equipment for access and egress, the distance to be negotiated;
 - iii. the distance and consequences of a potential fall;
 - iv. the duration and frequency of use;
 - v. the need for easy and timely evacuation and rescue in an emergency; and
 - vi. any additional risk posed by the use, installation or removal of that work equipment or by evacuation and rescue from it.

- The Contractor shall select work equipment for work at height which:
 - a) has characteristics including dimensions which:
 - i. are appropriate to the nature of the work to be performed including the foreseeable loadings; and
 - ii. allow passage without risk at that height, as well as underneath.
 - b) is in other respects the most suitable work equipment, having regard in particular to the purposes specified.

19.6 Fragile surfaces

19.6.1 The Contractor shall ensure that no person at work passes across or near, or working on, from or near, a fragile surface where it is reasonably practicable to carry out work safely and under appropriate ergonomic conditions without his doing so.

19.6.2 Where it is not reasonably practicable to carry out work safely and under appropriate ergonomic conditions without passing across or near, or working on, from or near, a fragile surface, every contractor shall:

- ensure, so far as is reasonably practicable, that suitable and sufficient platforms, coverings, guard rails or similar means of support or protection are provided and used so that any foreseeable loading is supported by such supports or borne by such protection;
- where a risk of a person at work falling remains despite the measures taken under the preceding provisions of this regulation, take suitable and sufficient measures to minimise the distances and consequences of his fall.

19.6.3 Where any person at work may pass across or near, or work on, from or near, a fragile surface, every contractor shall ensure that:

- prominent warning notices are so far as is reasonably practicable affixed at the approach to the place where the fragile surface is situated; or
- where that is not reasonably practicable, such persons are made aware of it by other means.

19.7 Falling objects

19.7.1 The Contractor shall, where necessary to prevent injury to any person, take suitable and sufficient steps to prevent, so far as is reasonably practicable, the fall of any material or object.

19.7.2 Every Contractor shall take suitable and sufficient steps to prevent any person being struck by any falling material or object which is liable to cause personal injury.

19.7.3 The Contractor shall ensure that no material or object is thrown or tipped from height in circumstances where it is liable to cause injury to any person.

19.7.4 Every employer shall ensure that materials and objects are stored in such a way as to prevent risk to any person arising from the collapse, overturning or unintended movement of such materials or objects.

19.8 Danger areas

19.8.1 Without prejudice to the preceding requirements of these Regulations, every contractor shall ensure that:

- where a workplace contains an area in which, owing to the nature of the work, there is a risk of any person at work
 - i. falling a distance; or
 - ii. being struck by a falling object.
- which is liable to cause personal injury, the workplace is so far as is reasonably practicable equipped with devices preventing unauthorised persons from entering such area; and
- such area is clearly indicated.

19.9 Inspection of work equipment

19.9.1 The Contractor shall ensure that, where the safety of work equipment depends on how it is installed or assembled, it is not used after installation or assembly in any position unless it has been inspected in that position.

19.9.2 The Contractor shall ensure that work equipment exposed to conditions causing deterioration which is liable to result in unsafe situations is inspected

- at suitable intervals; and
- each time that exceptional circumstances which are liable to jeopardise the safety of the work equipment have occurred, to ensure that health and safety conditions are maintained and that any deterioration can be detected and remedied in good time.

19.9.3 The Contractor shall ensure that a working platform

- used for construction work; and
- from which a person could fall 2 metres or more, is not used in any position unless it has been inspected in that position or, in the case of a mobile working platform, inspected on the site, within the previous 7 days.

19.9.4 The Contractor shall ensure that the reports of all inspections are properly maintained and shown to the Employer as and when required.

19.9.5 In this clause "inspection"

- means such visual or more rigorous inspection by a competent person as is appropriate for safety purposes;
- includes any testing appropriate for those purposes.

19.10 Inspection of places of work at height

19.10.1 The contractor shall so far as is reasonably practicable ensure that the surface and every parapet, permanent rail or other such fall protection measure of every place of work at height are checked on each occasion before the place is used.

19.11 Duties of persons at work

19.11.1 Any workmen employed by the Contractor shall report to the supervisor about any defect relating to work at height which he knows is likely to endanger the safety of himself or another person.

19.11.2 Every workmen shall use any work equipment or safety device provided to him for work at height by the contractor, in accordance with

- any training in the use of the work equipment or device concerned which have been received by him; and
- the instructions respecting that use which have been provided to him by the contractor as per the requirements of the Employer.

19.12 Requirements for existing places of work

19.12.1 Requirements for existing places of work and means of access or egress at height

- Every existing place of work or means of access or egress at height shall
 - a) be stable and of sufficient strength and rigidity for the purpose for which it is intended to be or is being used;

- b) where applicable, rest on a stable, sufficiently strong surface;
- c) be of sufficient dimensions to permit the safe passage of persons and the safe use of any plant or materials required to be used and to provide a safe working area having regard to the work to be carried out there;
- d) possess suitable and sufficient means for preventing a fall;
- e) possess a surface which has no gap
 - i. through which a person could fall;
 - ii. through which any material or object could fall and injure a person; or
 - iii. giving rise to other risk of injury to any person, unless measures have been taken to protect persons against such risk.
- f) be so constructed and used, and maintained in such condition, as to prevent, so far as is reasonably practicable
 - i. the risk of slipping or tripping; or
 - ii. any person being caught between it and any adjacent structure.
- g) where it has moving parts, be prevented by appropriate devices from moving inadvertently during work at height.

19.12.2 Requirements for guardrails, toe-boards, barriers and similar collective means of protection

- Unless the context otherwise requires, any reference in this section to means of protection is to a guardrail, toe-board, barrier or similar collective means of protection.
- Means of protection shall
 - a) be of sufficient dimensions, of sufficient strength and rigidity for the purposes for which they are being used, and otherwise suitable;
 - b) be so placed, secured and used as to ensure, so far as is reasonably practicable, that they do not become accidentally displaced; and
 - c) be so placed as to prevent, so far as is practicable, the fall of any person, or of any material or object, from any place of work.
- In relation to work at height involved in construction work

- a) the top guard-rail or other similar means of protection shall be at least 950 millimetres above the edge from which any person is liable to fall;
- b) toe-boards shall be suitable and sufficient to prevent the fall of any person, or any material or object, from any place of work; and
- c) any intermediate guardrail or similar means of protection shall be positioned so that any gap between it and other means of protection does not exceed 470 millimetres. The positioning of the guardrail shall be maintained at all times
 - i. Any structure or part of a structure which supports means of protection or to which means of protection are attached shall be of sufficient strength and suitable for the purpose of such support or attachment.

19.12.3 Requirements for all Working Platforms

- Every working platforms requires a supporting structure for holding it
- Any surface upon which any supporting structure rests shall be stable, of sufficient strength and of suitable composition safely to support the supporting structure, the working platform and any loading intended to be placed on the working platform.
- Stability of supporting structure
 - i. Any supporting structure shall
 - a) be suitable and of sufficient strength and rigidity for the purpose for which it is being used;
 - b) in the case of a wheeled structure, be prevented by appropriate devices from moving inadvertently during work at height;
 - c) in other cases, be prevented from slipping by secure attachment to the bearing surface or to another structure, provision of an effective anti-slip device or by other means of equivalent effectiveness;
 - d) be stable while being erected, used and dismantled; and
 - e) when altered or modified, be so altered or modified as to ensure that it remains stable.
 - f) Have suitable base plates and properly footed thereby.
- Stability of working platforms

- i. A working platform shall
 - a) be suitable and of sufficient strength and rigidity for the purpose or purposes for which it is intended to be used or is being used;
 - b) be so erected and used as to ensure that its components do not become accidentally displaced so as to endanger any person;
 - c) when altered or modified, be so altered or modified as to ensure that it remains stable; and
 - d) be dismantled in such a way as to prevent accidental displacement.
- Safety on working platforms
 - i. A working platform shall
 - a) be of sufficient dimensions to permit the safe passage of persons and the safe use of any plant or materials required to be used and to provide a safe working area having regard to the work being carried out there;
 - b) possess a suitable surface and, in particular, be so constructed that the surface of the working platform has no gap;
 - c) through which a person could fall;
 - d) through which any material or object could fall and injure a person; or
 - e) giving rise to other risk of injury to any person, unless measures have been taken to protect persons against such risk; and
 - f) be so erected and used, and maintained in such condition, as to prevent, so far as is reasonably practicable
 - g) the risk of slipping or tripping; or any person being caught between the working platform and any adjacent structure.
- Loading
 - i. A working platform and any supporting structure shall not be loaded so as to give rise to a risk of collapse or to any deformation, which could affect its safe use.
- Additional requirements for scaffolding
 - i. Strength and stability calculations for scaffolding shall be carried out unless

- a) a note of the calculations, covering the structural arrangements contemplated, is available; or
 - b) it is assembled in conformity with a generally recognised standard configuration.
- Depending on the complexity of the scaffolding selected, a competent person shall draw up an assembly, use and dismantling plan. This may be in the form of a standard plan, supplemented by items relating to specific details of the scaffolding in question.
 - A copy of the plan, including any instructions it may contain, shall be kept available for the use of persons concerned in the assembly, use, dismantling or alteration of scaffolding until it has been dismantled.
 - The dimensions form and layout of scaffolding decks shall be appropriate to the nature of the work to be performed and suitable for the loads to be carried and permit work and passage in safety.
 - While a scaffold is not available for use, including during its assembly, dismantling or alteration, it shall be marked with general warning signs in accordance with and be suitably delineated by physical means preventing access to the danger zone.
 - Scaffolding may be assembled, dismantled or significantly altered only under the supervision of a competent person and by persons who have received appropriate and specific training in the operations envisaged which addresses specific risks which the operations may entail and precautions to be taken, and more particularly in
 - i. understanding of the plan for the assembly, dismantling or alteration of the scaffolding concerned;
 - ii. safety during the assembly, dismantling or alteration of the scaffolding concerned;
 - iii. measures to prevent the risk of persons, materials or objects falling;
 - iv. safety measures in the event of changing weather conditions which could adversely affect the safety of the scaffolding concerned;
 - v. permissible loadings;
 - vi. any other risks which the assembly, dismantling or alteration of the scaffolding may entail.

19.13 Requirements for collective safeguards for arresting falls

- Collective safeguard are a safety net, airbag or other collective safeguard for arresting falls
- A safeguard shall be used only if
 - i. a risk assessment has demonstrated that the work activity can so far as is reasonably practicable be performed safely while using it and without affecting its effectiveness;
 - ii. the use of other, safer work equipment is not reasonably practicable; and
 - iii. a sufficient number of available persons have received adequate training specific to the safeguard, including rescue procedures.
- A safeguard shall be suitable and of sufficient strength to arrest safely the fall of any person who is liable to fall.
- A safeguard shall
 - i. in the case of a safeguard which is designed to be attached, be securely attached to all the required anchors, and the anchors and the means of attachment thereto shall be suitable and of sufficient strength and stability for the purpose of safely supporting the foreseeable loading in arresting any fall and during any subsequent rescue;
 - ii. in the case of an airbag, landing mat or similar safeguard, be stable; and
 - iii. in the case of a safeguard, which distorts in arresting a fall, afford sufficient clearance.
- Suitable and sufficient steps shall be taken to ensure, so far as practicable, that in the event of a fall by any person the safeguard does not itself cause injury to that person.

19.14 Requirements for personal fall protection systems

- A personal fall protection system shall be used only if
 - i. a risk assessment has demonstrated that the work can so far as is reasonably practicable be performed safely while using that system; and the use of other safer work equipment is not reasonably practicable; and
 - ii. the user and a sufficient number of available persons have received adequate training specific to the operations envisaged, including rescue procedures.

- A personal fall protection system shall
 - i. be suitable and of sufficient strength for the purposes for which it is being used having regard to the work being carried out and any foreseeable loading;
 - ii. where necessary, fit the user;
 - iii. be correctly fitted;
 - iv. be designed to minimise injury to the user and, where necessary, be adjusted to prevent the user falling or slipping from it, should a fall occur; and
 - v. be so designed, installed and used as to prevent unplanned or uncontrolled movement of the user.
- A personal fall protection system designed for use with an anchor shall be securely attached to at least one anchor, and each anchor and the means of attachment thereto shall be suitable and of sufficient strength and stability for the purpose of supporting any foreseeable loading.
- Suitable and sufficient steps shall be taken to prevent any person falling or slipping from a personal fall protection system.

19.15 Requirements for Ladders

- Every Contractor shall ensure that a ladder is used for work at height only if a risk assessment has demonstrated that the use of more suitable work equipment is not justified because of the low risk and
 - i. The short duration of use; or
 - ii. Existing features on site, which he cannot alter.
- Only approved metal ladders shall be allowed. Bamboo ladders are prohibited.
- Any surface upon which a ladder rests shall be stable, firm, of sufficient strength and of suitable composition safely to support the ladder so that its rungs or steps remain horizontal, and any loading intended to be placed on it.
- A ladder shall be so positioned as to ensure its stability during use
- A suspended ladder shall be attached in a secure manner and so that, with the exception of a flexible ladder, it cannot be displaced and swinging is prevented.
- A portable ladder shall be prevented from slipping during use by -

- i. securing the stiles at or near their upper or lower ends;
 - ii. an effective anti-slip or other effective stability device; or
 - iii. any other arrangement of equivalent effectiveness.
- A ladder used for access shall be long enough to protrude sufficiently above the place of landing to which it provides access, unless other measures have been taken to ensure a firm handhold.
 - No interlocking or extension ladder shall be used unless its sections are prevented from moving relative to each other while in use.
 - A mobile ladder shall be prevented from moving before it is stepped on.
 - Where a ladder or run of ladders raises a vertical distance of 9 metres or more above its base, there shall, where reasonably practicable, be provided at suitable intervals sufficient safe landing areas or rest platforms.
 - Every ladder shall be inspected at least every day before using
 - Every ladder shall be used in such a way that
 - i. a secure handhold and secure support are always available to the user; and
 - ii. the user can maintain a safe handhold when carrying a load unless, in the case of a step ladder, the maintenance of a handhold is not practicable when a load is carried, and a risk assessment has demonstrated that the use of a stepladder is justified because of the low risk; and the short duration of use.

20.0 Slipping, Tripping, Cutting and Falling Hazards

- 20.1 Sharp projections or any protruding nails or similar objects shall be suitably guarded or shall even be avoided to make the place safe to work.
- 20.2 Contractor shall not allow workmen to work or use platforms, scaffolds/passageways or any walkways, which has water, or oil or similar substances spilt and has a slipping hazard, unless it is cleaned off or covered or sanded or saw dusted or make it safe with any suitable material.
- 20.3 When workers are exposed to areas where fall into water is possible, the contractor shall provide suitable and adequate equipment for saving the workers from drowning and rescuing from such hazard. If the Employer considers, the contractor shall provide well-equipped boat or launch, manned with trained personnel at the work place.

20.4 Open side or opening where worker, equipment, vehicle or lifting appliance may fall at a building or outside shall be guarded suitably except in places of free access by reasons of nature of work.

20.5 Suitable safety net shall be provided at places of material / man falling is possible in accordance with national standards.

21.0 Lifting Appliances

21.1 General

Lifting appliances means a crane, hoist machinery, derrick, winch, jack, hoist drum, slewing machinery, pulley blocks, hooks or other equipment used for lifting materials, objects or building workers and lifting gears means ropes, chain slings, shackles, hooks, lifting lugs, wire ropes, lifting eyebolts and eyenuts and other accessories of a lifting appliance.

21.2 Size and Characteristics of Machine

No machine shall be selected to do any lifting on a specific job until its size and characteristics are considered against:

- the weights, dimensions and lift radii of the heaviest and largest loads
- the maximum lift height, the maximum lift radius and the weight of the loads that must be handled at each
- the number and frequency of lifts to be made
- how long the crane will be required on site
- whether loads will have to be walked or carried
- whether loads will have to be suspended for lengthy periods
- the site conditions, including the ground where the machine shall be set up, access roads and ramps it must travel, space for erection and any obstacles that might impede access or operation

21.3 Identification System of Tools

21.3.1 The Contractor shall also maintain a register containing a system of identification of all tools and tackles, its date of purchase, safe working load, competent person date of examination etc.

21.3.2 All alarms and signals like reverse horn, automatic safe load indicators (SLI), boom

angle indicators, boom extension indicators, over lift boom alarm, swing alarm, hydraulic safety valves, mechanical radius indicators, load moment indicators etc. shall be periodically examined and maintained always in working condition.

21.4 Qualification of Operator

21.4.1 The Contractor shall not employ any person to drive or operate any equipment like excavator, dozer, roller, dumper, crane or any other equipment whether driven by mechanical power or otherwise or to give signals to work as an operator of a rigger or derricks unless he:

- is above twenty-one years of age and possesses a valid heavy transport vehicle driving licence as per Motor Vehicle Act and Rules.
- is absolutely competent and reliable
- possesses the knowledge of the inherent risks involved in the operation of such equipment by undergoing a formal training at any institution of national importance acceptable to Employer

21.4.2 The operator cab shall posse good and safe:

- Structure, windows and windshield wipers
- Drivers chair and foot rest
- Control handles
- Cab instrumentation
- Telecommunication
- Cab out fitting

21.5 General requirements of appliances

21.5.1 The sweep area (work area) of the construction machinery shall be always free from obstructions.

21.5.2 All hydraulic piping and fittings shall be maintained leak proof.

22.0 Construction Machinery

22.1 General

Construction machineries may include excavators, dumpers and dump trucks, lift trucks, telescopic handlers, piling rigs, vibro hammers, welding equipments, mobile elevating work platforms, cranes, tipper lorries, lorry loaders, tankers, trailers, hydraulic and mechanical breakers etc.

22.2 Safe worthiness certificate

22.2.1 Every construction equipment shall be in sound mechanical working condition and certified by either competent person under Factories Act or manufacturers' warranty in case of brand new equipment or authorized persons / firms approved by Employer before induction to any site.

22.2.2 Every such certificate shall have the date of purchase, main overhauling undertaken in the past, any accident to the equipment, visual examination details, critical components safety check, list of safety devises and its working condition, manufacturer's maintenance checklist, past projects wherein the equipment were used etc. as its minimum content.

22.3 Reverse Horns

22.3.1 All Vehicles shall be fitted with audible reverse alarms and maintained in good working condition. Reversing shall be done only when there is adequate rear view visibility or under the directions of a banks man.

22.4 General Operating Procedures

- Drivers entering site shall be instructed to follow the safe system of work adopted on site. These shall be verbal instructions or, preferably, written instructions showing the relevant site rules, the site layout, delivery areas, speed limits, etc.
- No passengers shall be carried, unless specific seating has been provided in accordance with the manufacturer's recommendations.
- Working on gradients beyond any equipment's capability shall not be allowed.
- Prevention of dumper and dump truck accidents should be managed by providing wheel stops at a sufficient distance from the edges of excavations, spoil heaps, pits, etc.
- If a tractor dozer is employed on clearing scrub or felling trees, it shall be provided with adequate driver protection.

- In case of hydraulic breakers, hydraulic rams and hoses shall be in good working condition.
- Operators shall wear seat belts while operating the equipment at all times

22.5 Penalty

22.5.1 If any of the above clauses are not adhered, penalty shall be imposed as per relevant clause depending upon the gravity of the unsafe act and or condition.

23.0 Machine and General Area Guarding

23.1 The contractor shall ensure at the construction site all equipment, motors, chains and friction gearing, flywheels, shafting, dangerous and moving parts of machinery are securely fenced or legged. The fencing of dangerous part of machinery is not removed while such machinery is in motion or in use.

24.0 Manual Lifting and Carrying of Excessive Weight

24.1 The contractor shall ensure at his construction site of a building or other construction work that no building worker lifts by hand or carries overhead or over his back or shoulders any material, article, tool or appliances exceeding in weight as said below unless aided by another building worker or device. Maximum permissible lifting capacity for individuals is given in Table 2 below.

Table 2: Maximum Permissible Lifting capacity for individuals

Person	Maximum weight in kg.
Adult man	55
Adult woman	30

24.2 No building worker aided by other building worker shall lift or carry weight higher than or exceeding the sum of total of maximum limits set out for each building worker separately as mentioned in the table above.

25.0 Site Electricity

25.1 Competency of Electrical Personnel

25.1.1 The Contractor shall employ qualified and competent electrical personnel.

25.2 Assessment of Power

25.2.1 The Contractor shall assess the size and location of the electrical loads and the manner in which they vary with time during the currency of the contract.

25.2.2 The Contractor shall elaborate as to how the total supply is to be obtained / generated. The details of the source of electricity, earthing requirement, substation / panel boards, distribution system shall be prepared and necessary approval from Employer obtained before proceeding with the execution.

25.2.3 The main Contractor shall take consideration, the requirements of the sub / petty contractors' electric power supply and arrive at the capacity of main source of power supply from nearby power substation or diesel generators as applicable.

25.3 Strength and capability of electrical equipment

25.3.1 No electrical equipment shall be put into use where its strength and capability may be exceeded in such a way as may give rise to danger.

25.4 Adverse or hazardous environments

25.4.1 Electrical equipment which may reasonably foreseeably be exposed to:

- mechanical damage;
- effects of the weather, natural hazards, temperature or pressure;
- effects of wet, dirty, dusty or corrosive conditions; or
- any flammable or explosive substance, including dusts, vapours or gases, shall be of such construction or as necessary protected as to prevent, so far as is reasonably practicable, danger arising from such exposure.

25.5 Electrical protection circuits

25.5.1 Precautions shall be taken, either by earthing or by other suitable means, to prevent danger arising when any conductor (other than a circuit conductor) which may reasonably foreseeable become charged as a result of either the use of a system, or a fault in a system, becomes so charged. A conductor shall be regarded as earthed when conductors of sufficient strength and current-carrying capability to discharge electrical energy to earth connect it to the general mass of earth.

25.5.2 If a circuit conductor is connected to earth or to any other reference point, nothing which might reasonably be expected to give rise to danger by breaking the electrical continuity or introducing high impedance shall be placed in that conductor unless suitable precautions are taken to prevent that danger.

25.5.3 Appropriate electrical protection shall be provided for all circuits, against over load, short circuit and earth fault current.

25.5.4 The contractor shall provide sufficient ELCBs (maintain sensitivity 30 mA) / RCCBs for

all the equipment (including Potable equipment), electrical switchboards, distribution panels etc. to prevent electrical shocks to the workers.

25.5.5 All protection devices shall be capable of interrupting the circuit without damage to any equipment and circuits in case of any fault may occur.

25.5.6 Rating of fuses and circuit breakers used for the protection of circuits should be coordinate with equipment power ratings.

25.5.7 Protection against lightning shall be ensured to all equipment kept in open at sites.

25.6 Cables

25.6.1 Cables shall be selected after full consideration of the condition to which they shall be exposed and the duties for which they are required. Supply cable up to 3.3 kV shall be in accordance with BS 6346.

25.6.2 For supplies to mobile or transportable equipment where operating of the equipment subjects the cable to flexing, the cable shall conform to any of these codes BS 6007 / BS 6500 / BS 7375.

25.6.3 Flexible cords with a conductor cross sectional area smaller than 1.5 mm² shall not be used and insulated flexible cable shall conform to BS 6500 and BS 7375.

25.6.4 Where low voltage cables are to be used, reference shall be made to BS 7375. The following standards shall also be referred to particularly for underground cables BS 6346 and BS 6708

25.6.5 Cables buried directly in the ground shall be of a type incorporating armour or metal sheath or both. Such cables shall be marked by cable covers or a suitable marking tape and be buried at a sufficient depth to avoid their being damaged by any disturbance of the ground. Cable routes shall be marked on the plans kept in the site electrical register.

25.6.6 Cabling passing under the walk way and across way for transport and mobile equipment shall be laid in ducts at a minimum depth of 0.6 meters.

25.6.7 Cables that need to cross open areas, or where span of 3m or more are involved, a catenary wire on poles or other supports shall be provided for convenient means of suspension. Minimum height shall be 6 m above ground.

25.6.8 Cables carrying a voltage to earth in excess of 65V other than supply for welding process shall have metal armour or sheath, which has been effectively earthed and monitored by the contractor. In case of flexible and trailing cables such earthed metal sheath and/or armour should be in addition to the earth core in the cable and shall not be used as the protective conductor.

25.6.9 Armoured cables having an over-sheath of polyvinyl chloride (PVC) or oil resisting and flame retardant compound shall be used whenever there is a risk of mechanical damage occurring.

25.6.10 Cut or Damaged cables shall not be used and shall be replaced immediately.

25.7 Plugs, socket-outlets and couplers

25.7.1 The Contractor shall ensure plugs, socket-outlets, and couplers available in the construction site as “splash proof” type. The minimum degree of Ingress Protection should be of IP44 in accordance with BS EN 60529.

25.7.2 Only plugs and fittings of the weatherproof type shall be used and they should be colour coded in accordance with the internationally recognised standards for example as detailed as follows:

- 110 volts: Yellow.
- 240 volts: Blue.
- 415 volts: Red.

25.8 Connections

25.8.1 Every joint and connection in a system shall be mechanically and electrically suitable for use to prevent danger. Proper cable connectors as per national/international standards shall only be used to connect cables.

25.8.2 No loose connections or tapped joints shall be allowed anywhere in the work site, office area, stores and other areas. Penalty as per relevant clause shall be put in case of observation of any tapped joints.

25.9 Portable and hand held equipment

25.9.1 The contractor shall ensure the use of double insulated or all-insulated portable electrical hand equipment may be used without earthing (i.e. two core cables), but they shall still be used only on 110V because of the risk of damage to trailing leads.

25.10 Other equipment:

25.10.1 All equipment shall have the provision for major switch/cut-off switch in the equipment itself.

25.10.2 All non-current carrying metal parts of electrical equipment shall be earthed through insulated cable.

25.10.3 Isolate exposed high-voltage (over 415 Volts) equipment, such as transformer banks, open switches, and similar equipment with exposed energized parts and prevent unauthorised access.

25.11 Lighting

25.11.1 The Contractor shall provide sufficient site lighting, of the right type and at the right place for it to be properly effective. Lighting ought not to introduce the risk of electric shock. Therefore, 230V supplies should be used for those fittings, which are robustly installed, and well out of reach e.g. flood lighting or high-pressure discharge lamps.

25.11.2 The contractor shall ensure that luminaries should always be placed so that no person is required to work in their own shadow and so that the local light for one person is not a source of glare for the others. Strongly made clamps should be available for attaching luminaries to poles and other convenient supports.

25.11.3 Luminaries should be robust, resistant to corrosion and rain proof, especially at the point of the cable entry.

25.11.4 The correct type of lamp for each luminaire's should always be used and when lamps need to be replaced it shall be in accordance with the supply voltage.

25.11.5 Lamp holders not fitted with a lamp should be capped off.

26.0 Hand Tools and Power Tools

26.1 General

26.1.1 The Contractor is wholly responsible for the safe condition of tools and equipment used by his employees and that of his sub-contractors.

26.1.2 Use of short / damaged hand tools shall be prohibited and the contractor shall ensure all his hand tools used at his worksite are safe to work with or stored and shall also train his employees (including his sub-contractors) for proper use thereby.

26.1.3 All hand tools and power tools shall be duly inspected before use for safe operation.

26.1.4 All hand tools and power tools shall have sufficient grip and the design specification on par with national/international standards on anthropometrics.

26.2 Hand tools

26.2.1 Hand tools shall include saws, chisels, axes and hatches, hammers, hand planes, screw drivers, crow bars, and nail pullers.

26.2.2 The Contractor shall ensure that:

- For crosscutting of hardwood, saws with larger teeth points (no. of points per inch) shall be preferred to avoid the saw jumping out of the job.
- Mushroom headed chisels shall not be used in the worksite where the fragments of the head may cause injury.
- Unless hatchet has a striking face, it shall be used as a hammer.
- Only knives of retractable blades shall be used in the worksite.
- No screwdrivers shall be used for scraping, chiselling or punching holes.
- A pilot hole shall always be driven before driving a screw.
- Wherever necessary, usage of proper PPEs shall be used by his employees.

26.3 Power tools

26.3.1 Power tools include drills, planes, routers, saws, jackhammers, grinders, sprayers, chipping hammers, air nozzles and drills.

26.3.2 The Contractor shall ensure that:

- Electric tools are properly grounded or / and double insulated.
- GFCIs/ RCCBs shall be used with all portable electric tool operated especially outdoors or in wet condition.
- Before making any adjustments or changing attachments, his workers shall disconnect the tool from the power source.
- Tool is held firmly and the material is properly secured before turning on the tool.
- All drills shall have suitable attachments respective of the operations and powerful for ease of operation.
- When any work / operation need to be performed repeatedly or continuously, tools specifically designed for that work shall be used. The same is applicable to detachable tool bit also.
- Size of the drill shall be determined by the maximum opening of the chuck n case of drill bit.

- Attachments such as speed reducing screwdrivers and buffers shall be provided to prevent fatigue and undue muscle strain to his workers.
- Stock should be clamped or otherwise secured firmly to prevent it from moving.
- Workers shall never stand on the top of the ladder to drill holes in walls / ceilings, which can be hazardous, instead standing on the fourth or fifth rung shall be recommended.
- Electric plane shall not be operated with loose clothing or long scarf or open jacket.
- Safety guards used on right angle head or vertical portable grinders must cover a minimum of 180 degree of the wheel and the spindle / wheel specifications shall be checked.
- All power tools / hand tools shall have guards at their nip points.
- Low profile safety chain shall be used in case of wood working machines and the saw shall run at high rpm when cutting and also correct chain tension shall be ensured to avoid “kickback”.
- Leather aprons and gloves shall be used as an additional personal protection auxiliary to withstand kickback.
- Push sticks shall be provided and properly used to hold the job down on the table while the heels moves the stock forward and thus preventing kickbacks.
- Air pressure is set at a suitable level for air actuated tool or equipment being used. Before changing or adjusting pneumatic tools, air pressure shall be turned off.
- Only trained employees shall use explosive actuated tools and the tool shall also be unloaded when not in use.
- Usage of such explosive actuated tools shall be avoided in case of places where explosive/flammable vapours or gases may be present.
- Explosive actuated tools and their explosives shall be stored separately and be taken out and loaded only before the time of immediate use.
- Misfired cartridges of explosive actuated tools must be placed in a container of water and be removed safely from the project.
- No worker shall point any power operated / hand tool to any other person especially during loading / unloading.

26.4 Welding, Gouging and Cutting

- 26.4.1 Gas cylinders in use shall be kept upright on a custom-built stand or trolley fitted with a bracket to accommodate the hoses and equipment or otherwise secured. The metal cap shall be kept in place to protect the valve when the cylinder is not connected for use.
- 26.4.2 Hose clamp or clip shall be used to connect hoses firmly in both sides of cylinders and torches.
- 26.4.3 All gas cylinders shall be fixed with pressure regulator and dial gauges
- 26.4.4 Non-return valve and Flashback arrester shall be fixed at both end of cylinder and torch.
- 26.4.5 Domestic LPG cylinders shall not be used for Gas welding and Cutting purpose.
- 26.4.6 DCP or CO2 type Fire Extinguisher not less than 5 kg shall be fixed at or near to welding process zone in an easily accessible location. Fire Extinguisher should confirm to IS 2190: 1992.
- 26.4.7 Use firewatchers if there is a possibility of ignition unobserved by the operator (e.g. on the other side of bulkheads).
- 26.4.8 Oxygen cylinders and flammable gas cylinders shall be stored separately, at least 6.6 meters (20 feet) apart or separated by a fire proof, 1.6 meters (5 feet) high partition. Flammable substances shall not be stored within 50 feet of cylinder storage areas.
- 26.4.9 Transformer used for electrical arc welding shall be fixed with Ammeter and Voltmeter and also fixed with separate main power switch.
- 26.4.10 Welding grounds and returns should be securely attached to the work by cable lugs, by clamps in the case of stranded conductors, or by bolts for strip conductors. The ground cable shall not be attached to equipment or existing installations or apparatus.
- 26.4.11 Use a low voltage open circuit relay device if welding with alternating current in constricted or damp places.
- 26.4.12 Take precautions against the risk of increased fume hazards when welding with chrome containing fluxed consumables or high current metal inert gas (MIG) or tungsten inert gas (TIG) processes.
- 26.4.13 Avoid being in contact with water or wet floors when welding. Use duckboards or rubber protection.

26.4.14 All electrical installations shall meet the IS: 5571: 1997 and NFPA 70 for gas cylinder storage area and other hazardous areas.

26.4.15 The current for Electric arc welding shall not exceed 300 A on a hand welding operation.

27.0 Dangerous and Harmful Environment

No worker shall be allowed into any confined space or trench or excavation wherein there is given off any dust, fumes / vapours or other impurities which is likely to be injurious or offensive, explosive or poisonous or noxious or gaseous material or other harmful articles unless steps are carried out by the contractor and certified by the responsible person to be safe.

28.0 Fire Prevention, Protection and Fighting System

28.1 General

The Contractor shall ensure that construction site is provided with fire extinguishing equipment sufficient to extinguish any probable fire at construction site.

28.1.1 Recharging of fire extinguishers and their proper maintenance should be ensured and as a minimum should meet Indian National Standards

28.1.2 All drivers of vehicles, foreman, supervisors and managers shall be trained on operating the fire extinguishers and firefighting equipment.

28.1.3 All lifting appliances' driver cabin should be provided with a suitable portable fire extinguisher.

28.1.4 Combustible scrap and other construction debris should be disposed off site on a regular basis. If scrap is to be burnt on site, the burning site should be specified and located at a distance no less than 12 metres from any construction work or any other combustible material.

28.1.5 Every fire, including those extinguished by contractor personnel, shall be reported to the Employer representatives.

28.1.6 Emergency plans and Fire Evacuation plans shall be prepared and issued. Mock drills should be held atleast once every 3 months, to ensure the effectiveness of the arrangements and as a part of the programme, the Telephone Number of the local fire brigade should be prominently displayed near each telephone on site.

29.0 Corrosive Substances

Corrosive substances including alkalis and acids shall be stored and used by a person dealing with such substances at a building / construction site in a manner that it does not endanger the building worker and suitable PPE shall be provided by the contractor to the worker during such handling and work. In case of spillage of such substances on building worker, the contractor shall take immediate remedial measures.

30.0 Traffic Management

30.1 General

The basic objective of the following guidelines is to lay down procedures to be adopted by contractor to ensure the safe and efficient movement of traffic and also to ensure the safety of workmen at construction sites. The guiding principles to be adopted for safety in construction zone are to:

- Warn the road user clearly and sufficiently in advance.
- Provide safe and clearly marked lanes for guiding road users.
- Provide safe and clearly marked buffer and work zones
- Provide adequate measures that control driver behaviour through construction zones.
- Provide additional support in the form of a flag man at all times, to assist the operator of the equipment or a heavy transport vehicle

30.2 Warning signs

30.2.1 Warning signs shall be displayed in the area wherever required such as deep excavation, work at height or any other area pointed out by Employer's Engineer / Employer.

30.2.2 Materials hanging over / protruded from the chassis / body of any vehicle especially during material handling shall be indicated by red indicator (red light/flag) to indicate the caution to the road users.

30.3 Delineators

- The delineators are the elements of a total system of traffic control and have two distinct purposes:
 - i. To delineate and guide the driver to and along a safe path

- ii. As a taper to move traffic from one lane to another.

30.3.1 These channelizing devices such as cones, traffic cylinders, tapes and drums shall be placed in or adjacent to the roadway to control the flow of traffic. These should normally be retro-reflectors complying with IRC: 79 - Recommended Practice for Road Delineators.

30.3.2 Traffic cones and cylinders

- Traffic cones of 500mm, 750mm and 1000mm high and 300mm to 500mm in diameter or in square shape at base and are often made of plastic or rubber and normally have retro-reflectorized red and white band shall be used wherever required.
- Damaged cones shall be replaced immediately

30.3.3 Drums

- Drums about 800mm to 1000mm high and 300mm in diameter can be used either as channelizing or warning devices. These are highly visible, give the appearance of being formidable objects and therefore command the respect of drivers.
- Damaged drums shall be replaced immediately

30.3.4 The contractor shall ensure that all his construction vehicles plying on public roads (like dump trucks, trailers, etc.) have proper license to ply on public roads from the State Transport Authority. Drivers holding proper valid license as per the requirements of Motor Vehicles Act shall drive these vehicles.

30.3.5 The contractor shall not undertake loading and unloading at carriageways obstructing the free flow of vehicular traffic and encroachment of existing roads by the contractor applying the excuse of work execution.

30.3.6 Tow away vehicle

- The contractor shall make arrangements keeping tow away van / manpower to tow away any breakdown vehicle in the traffic flow without losing any time at his cost.

31.0 Personal Protective Equipment (PPE)

31.1 The contractor shall provide required PPEs to workmen to protect against safety and or health hazards. Primarily PPEs are required for the following protection:

- Head Protection (Safety helmets)

- Foot Protection (Safety footwear, Gumboot, etc.)
- Body Protection (High visibility clothing (waistcoat/jacket), Apron, etc.)
- Personal fall protection (Full body harness, Rope-gap fall arrester, etc.)
- Eye Protection (Goggles, Welders glasses, etc.)
- Hand Protection (Gloves, Finger coats, etc.)
- Respiratory Protection. (Nose mask, SCBAs, etc.)
- Hearing Protection (Ear plugs, Ear muffs, etc.)

31.2 The PPEs and safety appliances provided by the contractor shall be of the standard as prescribed by Bureau of Indian Standards (BIS). If materials conforming to BIS standards are not available, the contractor as approved by the Employer shall procure PPE and safety appliances.

31.3 All construction workers should be provided with high visibility jackets with reflective tapes conforming to the requirement specified under BS EN 471: 1994 as most of viaduct /tunnelling and station works are executed either above or under right-of-way. The visibility of workmen at all times shall be increased so as to protect them from speeding vehicular traffic.

31.4 The Contractor shall provide safety helmet, safety shoe and high visibility clothing for all employees including workmen, traffic marshal and other employees who are engaged for any work under this contract as per the requirement.

31.5 Colour coding for helmets: Contractors shall follow the colour code for safety helmets as described in the Table 3 below:

Table 3: Safety Colour Code

Safety Helmet Colour Code (Every Helmet should have the LOGO* affixed /painted)	Person to use
White	Company staff
Grey	All Designers, Architect, Consultants, etc.
Violet	Main Contractors (Engineers / Supervisors)
Blue	All Sub-contractors (Engineers / Supervisors)
Red	Electricians (Both Contractor and Sub-contractor)
Green	Safety Professionals (Both Contractor and Sub-contractor)

Orange	Security Guards / Traffic marshals
Yellow	All workmen
White (with "VISITOR" sticker)	Visitors

* The contractor company's respective logo

- Logo shall have its outer dimension 2"X 2" and shall be conspicuous.
- Logo shall be either painted or affixed.

In addition to the above any other PPE required for any specific jobs like, welding and cutting, working at height etc. shall also be provided to all workmen and also ensure that all workmen use the PPEs properly while on the job.

31.6 The contractor shall not pay any cash amount in lieu of PPE to the workers/sub-contractors and expect them to buy and use during work.

31.7 The contractor shall at all-time maintain a minimum of 10% spare PPEs and safety appliances and properly record and show to the Employer during the inspections. Failing to do so shall invite appropriate penalty as per the provisions of the contract.

31.8 It is always the duty of the contractor to provide required PPEs for all visitors. Towards this required quantity of PPEs shall always be kept at the security post.

32.0 Visitors to Site

32.1 No visitor is allowed to enter the site without the permission of the Employer. All authorised visitors should report at the site office. Contractor shall provide visitor's helmet (White helmet with visitor sticker) and other PPEs like Safety Shoe, reflective jacket, respiratory protection etc. as per requirement of the site.

32.2 All Visitors shall be accompanied at all times by a responsible member of the site personnel.

32.3 The Contractor shall be fully responsible for all visitors' safety and health within the site.

33.0 Occupational Health and Welfare

33.1 Medical Facilities

33.1.1 The contractor shall arrange a medical examination of all his employees including his sub-contractor employees employed as drivers, operators of lifting appliances and transport equipment before employing, after illness or injury, if it appears that

the illness or injury might have affected his fitness and, thereafter, once in every two years up to the age of 40 and once in a year, thereafter.

33.1.2 The Contractor shall maintain the confidential records of medical examination or the physician authorized by the Employer.

33.1.3 No building or other construction worker is charged for the medical examination and the cost of such examination is borne by contractor employing such building worker.

33.1.4 If the contractor fails to get the medical examination conducted as mentioned above, the Employer shall have the right to get the same conducted by through an agency with intimation to the contractor and deduct the cost and overhead charges.

33.1.5 The Contractor shall make it mandatory for all the workmen groups to resort to stressing exercises every morning for twenty minutes before the start of work. The Contractor shall appoint competent person as a leader who will ensure daily exercising of all workmen.

33.2 Ambulance van and room

33.2.1 The Contractor shall ensure at a construction site of a building or other construction work that an ambulance van and room are provided at such construction site or an arrangement is made with a nearby hospital for providing such ambulance van for transportation of serious cases of accident or sickness of workers to hospital promptly and such ambulance van and room are maintained in good condition and is equipped with standard facilities.

33.3 First-aid boxes

33.3.1 The Contractor shall ensure one well maintained First-aid box for every 100 workers on the construction site. Every First-aid box shall be distinctly marked "First-aid" and be equipped with all items required for first aid treatment.

33.3.2 HIV/ AIDS prevention and control

The Contractor shall adopt the Policies on "HIV / AIDS Prevention and Control for Workmen Engaged.

33.4 Prevention of mosquito breeding

33.4.1 Measures shall be taken to prevent mosquito breeding at site. The measures to be taken shall include:

- Empty cans, oil drums, packing and other receptacles, which may retain water shall be deposited at a central collection point and shall be removed from the site regularly.
- Still waters shall be treated at least once every week with oil in order to prevent mosquito breeding.
- Contractor's equipment and other items on the site, which may retain water, shall be stored, covered or treated in such a manner that water could not be retained.
- Water storage tanks shall be provided.

33.4.2 Posters in Hindi, English & local language, which draw attention to the dangers of permitting mosquito breeding, shall be displayed prominently on the site.

33.4.3 The Contractor at periodic interval and upon the request of the Employer shall arrange to prevent mosquito breeding by fumigation / spraying of insecticides. Most effective insecticides shall include SOLFAC WP 10 or Baytex, The Ideal Larvicide etc.

33.5 Alcohol and drugs

33.5.1 The Contractor shall ensure at all times that no employee is working under the influence of alcohol / drugs which are punishable under Govt. regulations.

33.5.2 Smoking at public worksites by any employee is also prohibited as per Govt. regulations.

33.6 Noise

33.6.1 The Contractor shall, at his own expense, take all appropriate measures to ensure that work carried out by the Contractor and by his sub-Contractors, whether on or off the Site, shall not cause any unnecessary or excessive noise which may disturb the occupants of any nearby dwellings, schools, hospitals, or premises with similar sensitivity to noise.

33.6.2 The Contractor shall ensure that noise generated by work carried out by the Contractor and his sub-Contractors during daytime and night time shall not exceed the maximum permissible noise limits, whether continuously or intermittently, as stipulated by MoEF conditions. In the event of a breach of this requirement, the Contractor shall immediately re-deploy or adjust the relevant equipment or take

other appropriate measures to reduce the noise levels and thereafter maintain them at levels which do not exceed the said limits.

33.7 Occupational Noise

33.7.1 Protection against the effects of occupational noise exposure should be provided when the sound level exceeds the threshold values.

33.7.2 When employees are subjected to sound levels exceeding those listed in the Table, feasible administrative or engineering controls should be utilized as given in this document.

33.7.3 If such controls fail to reduce sound levels personal protective equipment shall be provided.

33.7.4 SH&E

33.8 Vibration Level

33.8.1 In locations where the alignment is close to historical / heritage structures, the contractor shall prepare a monitoring scheme prior to construction at such locations. The scheme shall include:

33.8.2 Monitoring requirements for vibrations at regular intervals throughout the construction period.

33.8.3 Pre-construction structural integrity inspections of historic and sensitive structures in project activity.

33.8.4 Information dissemination about the construction method, probable effects, quality control measures and precautions to be used.

34.0 Environmental Management

34.1 Air Quality

34.1.1 The Contractor shall take all necessary precautions to minimise fugitive dust emissions from operations involving excavation, grading, and clearing of land and disposal of waste. He shall not allow emissions of fugitive dust from any transport, handling, construction or storage activity to remain visible in atmosphere beyond the property line of emission source for any prolonged period of time without notification to the Employer.

34.1.2 The Contractor shall use construction equipment designed and equipped to minimise or control air pollution. He shall maintain evidence of such design and equipment and make these available for inspection by Employer.

- 34.1.3 If after commencement of construction activity, Employer believes that the Contractor's equipment or methods of working are causing unacceptable air pollution impacts then these shall be inspected and remedial proposals shall be drawn up by the Contractor, submitted for review to the Employer and implemented.
- 34.1.4 In developing these remedial measures, the Contractor shall inspect and review all dust sources that may be contributing to air pollution. Remedial measures include use of additional / alternative equipment by the Contractor or maintenance / modification of existing equipment of the Contractor.
- 34.1.5 The Contractor shall establish and maintain records of routine maintenance program for internal combustion engine powered vehicles and equipment used on this project. He shall keep records available for inspection by Employer.
- 34.1.6 The Contractor shall cover loads of dust generating materials like debris and soil being transported from construction sites. All trucks carrying loose material should be covered and loaded with sufficient free - board to avoid spills through the tailboard or sideboards.
- 34.1.7 The Contractor shall promptly transport all excavation disposal materials of whatever kind so as not to delay work on the project. Stockpiling of materials shall only be allowed at sites designated by the Employer. The Contractor shall place excavation materials in the dumping/disposal areas designated in the plans as given in the specifications.
- 34.1.8 The temporary dumping areas shall be maintained by the Contractor at all times until the excavated soil is re-utilised for backfilling or as directed by Employer. Dust control activities shall continue even during any work stoppage.
- 34.1.9 The Contractor shall water down construction sites as required to suppress dust, during handling of excavation soil or debris or during demolition. The Contractor shall make water sprinklers, water supply and water delivering equipment available at any time that it is required for dust control use. Dust screens shall be used, as feasible when additional dust control measures are needed especially where the work is near sensitive receptors.
- 34.1.10 The Contractor shall submit to the Employer an Air Monitoring and Control Plan (AMCP) as per contract specific Environment Management Plan to guide construction activity in so far as it relates to monitoring, controlling and mitigating air pollution.

34.2 Water Quality

- 34.2.1 The Contractor must comply with the requirements of the Central Ground Water Board for discharge of water arising from dewatering. Any water obtained from

dewatering systems installed in the works must be either re-used for construction purposes and this water may subsequently be discharged to the drainage system or, if not re-used, recharged to the ground water at suitable aquifer levels. The Contractor shall not be permitted to directly discharge, to the drainage system, unused ground water obtaining from the excavation without obtaining approval of Employer or the Agency controlling the system.

- 34.2.2 The Contractor shall ensure that earth, bentonite, chemicals and concrete agitator washings etc. are not deposited in the watercourses but are suitably collected and residue disposed off in a manner approved by local authorities.
- 34.2.3 All water and waste products (surface runoff and wastewater) arising on the site shall be collected and removed from the site via a suitable and properly designed temporary drainage system and disposed off at a location and in a manner that shall cause neither pollution nor nuisance.
- 34.2.4 The Contractor shall discharge wastewater arising out of site office, canteen or toilet facilities constructed by him into sewers through a wastewater drainage system to be constructed by the Contractor for proper discharge, after obtaining prior approval of Employer / Employer's authorized representative controlling the system.
- 34.2.5 The bentonite mixing, treatment and handling system shall be established by the contractor giving due regard to its environmental impacts. The disposal of redundant bentonite shall be carefully considered whether in bulk or liquid form. The disposal location shall be advised and agreed with the relevant authorities.
- 34.2.6 The Contractor shall take measures to prevent discharge of oil and grease during spillage from reaching drainage system or any water body. Oil removal / interceptors shall be provided to treat oil waste from workshop areas etc.
- 34.2.7 The Contractor shall apply to the appropriate authority for installing bore wells for water supply at site.

34.3 Felling of Trees

- 34.3.1 The contractor shall identify the number and type of trees that are require to be felled as a result of construction of works and facilities related to Project and inform the Employer.
- 34.3.2 All trees and shrubbery, which are not specifically require to be cleared or removed for construction purposes, shall be preserved and shall be protected from any damage that may be caused by Contractor's construction operations and equipment. The contractor shall not fell, remove or dispose of any tree or forest produce in any land handed over to him for the construction of works and facilities related to

Dholera SIR except with the previous permission obtained from the Forest Department.

34.3.3 The Employer shall assist the Contractor in obtaining the Applicable Permits for felling of trees to be identified by the Employer for this purpose if and only if such trees cause a Material Adverse Effect on the construction or maintenance of the Project Works. The Parties hereto agree that the felled trees shall be deemed to be owned by the Employer and shall be disposed in such manner and subject to such conditions as the Employer may in its sole discretion deem appropriate. For the avoidance of doubt, the Parties agree that if any felling of trees hereunder is in a forest area, the Applicable Permit thereof shall be procured by the Employer within the time specified in the Agreement.

34.3.4 Special care shall be exercised where trees or shrubs are exposed to injuries by construction equipment, blasting, excavating, dumping, chemical damage or other operation and the Contractor shall adequately protect such trees by used of protective barriers or other methods approved by the Employer. Trees shall not be used for anchorage.

35.0 Solid Waste Management

During construction, two types of solid waste are expected to be generated – construction & demolition (C&D) waste and municipal waste generated from the labour colonies.

The Contractor responsible for the construction activities shall be responsible for sound handling and management of the C&D and municipal waste at the construction site. It is suggested that the civil contractor adopts the concept of 3 Rs – Reduce, Reuse, Recycle. The contractor shall submit a C&D waste management plan which includes plans for waste reduction, C&D storage, collection and transportation and disposal.

The following management measures are suggested which shall be implemented by the civil contractor at construction sites:

35.1 Construction Waste Management

35.1.1 Storage at Construction Site

- Dumping of C&D waste in non-designated sites shall be strictly prohibited.
- All construction/demolition waste will be stored within the site itself. Metal mesh screen or GI screens will be provided so that the waste does not get scattered.

- C&D waste shall be stored separately and not allowed to get mixed with other waste (e.g., municipal / biomedical / e-waste / hazardous etc.).
- Civil contractors to ensure appropriate handling, storage, collection, re-use and clearing of the wasted construction material. The non-utilizable and utilizable C&D waste generated at site will be stored in a segregated manner at the construction site. Reusable items will be used during construction activities; levelling, making roads etc.
- The civil contractors to ensure that appropriate numbers of skip containers or trolleys are provided on construction site, which can be removed with skip lifters as the case may be.
- The storage bins/ designated area shall be in accordance with the quantum and nature of the C&D waste.
- Rain protection (shed and at the floor) to be provided for the storage of construction materials.
- Clearly label the containers, preferably with waterproof signage, detailing which material can be disposed of in each one.
- In case of road construction, empty containers of paint, prime coat, tack coat (considered as hazardous waste) shall be stored at a designated place / or a skip and sent to an authorized hazardous waste handler. All the records of the sale of items to authorized hazardous waste vendors will be preserved 7 years after completion and final payment of the contract.

35.1.2 Collection/ transportation and Disposal of C&D waste

- Collection of the un-utilizable C&D waste within the construction site will be done mechanically (JCBs, LHD (load, haul, dump) etc.) with minimum human intervention.
- The skips will be emptied at regular intervals by the using hook loader trucks. The contractor will transport the waste to a designated area/ location/ facility as directed by Employer.

35.2 Municipal Waste Management

The contractor will be responsible for managing the municipal waste arising out of labour camps. This will primarily comprise of kitchen and general domestic waste (glass, paper, metal, inerts etc.) and sewage from toilets. The contractor will be responsible for segregated storage, collection, transportation, processing and disposal of such waste. Following measures shall be adopted by the contractor for appropriate waste handling:

- Civil contractor shall provide colour-coded twin bins which will be placed outside each of the accommodation units provided to the labour, for disposal of wet kitchen waste and dry recyclables. Such bins will be distributed free of cost to the labours by the contractor.
- The civil contractor shall install organic waste composter/ convertor (OWC) machine of required capacity to treat all the kitchen waste (wet organic waste).
- The recyclables like paper, plastic, metal are to be stored separately and sold to a recycler.
- The Contractor will also distribute a twin bin (120 X2 litre capacity) to the nearby dhabha/ petty shop occurring within 500 metres radius of the construction site, where the labours visit often for food/ tea/ snacks/ cigarette/ bidi during the day.

Definitions:

- "Construction and demolition waste" means the waste comprising of building materials, debris and rubble resulting from construction, re-modelling, repair and demolition of any civil structure;
- "Disposal" means the final and safe disposal of solid waste on land to prevent contamination of ground water, surface water, ambient air and attraction of animals or birds;
- "Dry waste" means waste other than food waste and inert and includes recyclable waste, non-recyclable waste, combustible waste and sanitary waste;
- "Handling" includes all activities relating to sorting, segregation, material recovery, secondary storage, shredding, baling, crushing, loading, unloading, transportation, processing and disposal of solid wastes;
- "Bio-degradable waste" means any organic material that can be degraded by micro-organisms into simpler stable compounds;
- "Non - biodegradable waste" means any waste that cannot be degraded by micro-organisms into simpler stable compounds;
- "Recycling" means the process of transforming segregated solid waste into a new product or raw material for producing new products;
- "Segregation" means sorting and separate storage of various components of solid waste namely biodegradable wastes or wet waste, non-biodegradable wastes or dry waste including recyclable waste, combustible waste sanitary

waste and non - recyclable waste, domestic hazardous wastes, e-waste and construction and demolition wastes;

- "Transportation" means conveyance of solid waste, either treated, partly treated or untreated from a location to another location in an environmentally sound manner through specially designed and covered transport system so as to prevent the foul odour, littering and unsightly conditions;

36.0 Hazardous Waste Management

- 36.1 If encountered or generated as a result of Contractor's activity, then waste classified as hazardous under the "Hazardous Wastes (Management & Handling) Rules, 1989, amendments 2000, 2003" shall be disposed off in a manner in compliance with the procedure given in the rules under the aforesaid act.
- 36.2 Chemicals classified as hazardous chemicals under "Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 of Environment (Protection) Act, 1986 shall be disposed off in a manner in compliance with the procedure given in the rules under the aforesaid act.
- 36.3 The contractor shall identify the nature and quantity of hazardous waste generated as a result of his activities and shall file a 'Request for Authorisation' with Gujarat State Pollution Control Board along with a map showing the location of storage area.
- 36.4 Outside the storage area, the contractor shall place a 'display board', which shall display quantity and nature of hazardous waste, on date. Hazardous Waste needs to be stored in a secure place.
- 36.5 It shall be the responsibility of the contractor to ensure that hazardous wastes are stored, based on the composition, in a manner suitable for handling, storage and transport. The labelling and packaging is required to be easily visible and be able to withstand physical conditions and climatic factors.
- 36.6 The contractor shall approach only Authorised Recyclers of Hazardous Waste for disposal of Hazardous Waste, under intimation to the Employer.
- 36.7 Submittal of all environment related documents and records pertaining to monitoring and trend analysis on key parameters such as but not limited to consumption/efficient use of resources such as energy, water, material such as cement, fly ash, iron and steel, recycle/reuse of waste etc that shall have demonstrated continual improvement in the implementation of Environmental management System. Failure to do so the employer shall impose appropriate penalty as indicated under penalty clause.

37.0 Energy Management

37.1 The contractor shall use and maintain equipment so as to conserve energy and shall be able to produce demonstrable evidence of the same upon Employer's request.

37.2 Measures to conserve energy include but not limited to the following:

- Use of energy efficient motors and pumps
- Use of energy efficient lighting, which uses energy efficient luminaries
- Adequate and uniform illumination level at construction sites suitable for the task
- Proper size and length of cables and wires to match the rating of equipment
- Use of energy efficient air conditioners

37.3 The contractor shall design site offices maximum daylight and minimum heat gain. The rooms shall be well insulated to enhance the efficiency of air conditioners and the use of solar films on windows may be used where feasible.

38.0 Radiation

38.1 The use of radioactive substances and radiating apparatus shall comply with the Govt. regulatory requirements and all subsidiary legislation.

38.2 An operation involving ionising radiation shall only be carried out after having been reviewed without objection by the Employer's representative and shall be carried out in accordance with a method statement.

38.3 Each area containing irradiated apparatus shall have warning notices and barriers, as required by the Regulations, conspicuously posted at or near the area.

38.4 Radioactive substances shall be stored, used or disposed shall be strictly in accordance with the Govt. Enactments.

38.5 The contractor shall ensure that all site personnel and members of the public are not exposed to radiation.

39.0 Charges to be recovered from Contractor for Unsafe Act or Condition

39.1 The Employer aims to build an image of one of the best safety conscious practice in DSIR construction and operation. An unsafe act or conduct on the construction site may result into an illness, injury, property damage or worst, loss of life. The Contractor is expected to take safety very seriously and shall keep the construction

site safe at all times. The Employer shall practice a zero tolerance towards unsafe behaviour by any parties on the construction site. The Employer shall recover the cost of damages from the contractors for every reportable incident (fatality / injury).

39.2 Table 4 below indicates the Safety, Health and Environment violation (unsafe act / unsafe condition) and charges to be recovered from contractors.

Table 4: SH&E Violation Charges

Sr	Topic	Unsafe Act / Unsafe Condition	Deductible Amount
1	SH&E Plan	<ul style="list-style-type: none"> a) Not as per Employers' content and coverage. b) Delay in submission. c) Copies not provided to all required supervisors / engineers. 	Rs. 50,000 per single violation, compounded to a maximum of Rs.2,00,000 at any single instance.
2	SH&E Organisation	<ul style="list-style-type: none"> a) Not complying with the minimum manpower requirements as per the bid document. b) Not filling up the vacancies created due to SH&E personnel leaving the contractor within 14 days. 	<ul style="list-style-type: none"> a) Rs. 50,000 per month b) Rs. 50,000 per month
3	SH&E Committee	<ul style="list-style-type: none"> a) Failed to formulate or conduct SH&E Committee meeting for any month. b) Failed to conduct Site inspection before conducting SH&E Committee meeting. c) Failed to send SH&E Committee Meeting minutes or Agenda to Employer in time. 	<ul style="list-style-type: none"> a) Rs. 50,000 for each violation Rs.25, 000 for first violation and Rs.50, 000 for subsequent violations.
4	SH&E Training	<p>Not complying to the requirements as mentioned in conditions of contract on SH&E and project SH&E manual with regard to:</p> <ul style="list-style-type: none"> a) Induction training not given. b) Supervisor/engineer/manager training not conducted. c) Refresher training not conducted. d) Tool-box talk not conducted. 	Rs.10, 000 for each violation.

Sr	Topic	Unsafe Act / Unsafe Condition	Deductible Amount
5	SH&E Inspection	Not complying to the requirements as mentioned in conditions of contract on SH&E and project SH&E manual	Rs.50, 000 for first violation and Rs.1, 00,000 for subsequent violations.
6	SH&E awareness days	SH&E Days not observed.	Rs.10, 000 for each violation.
7	Injury and Incidence Reporting	<p>a) Fatal accidents.</p> <p>b) Injury accident.</p> <p>c) Abnormal delay in reporting accidents or wilful suppression of information about any accidents / dangerous occurrence.</p>	<p>a) Rs. 5, 00,000 for first fatality and Rs. 10,00,000 for every subsequent fatality.</p> <p>b) Rs. 1,00,000 for first grievously injured person and Rs. 2,00,000 for every subsequent grievously injured person (Grievous injury as defined in Workmen Compensation Act).</p> <p>c) Rs. 25,000 for each violation</p>
8	Housekeeping	<p>a) Housekeeping of construction worker housing, site office establishments etc.</p> <p>b) Surrounding areas of drinking water tanks / taps not hygienically cleaned /</p>	Rs.10,000 per single violation Compounded to a maximum of Rs.50,000 at any next single

Sr	Topic	Unsafe Act / Unsafe Condition	Deductible Amount
		<p>maintained.</p> <p>c) Office, stores, toilet / urinals not properly cleaned and maintained.</p> <p>d) Required dustbins at appropriate places not provided / not cleaned.</p> <p>e) Openings unprotected.</p> <p>f) Vehicles / equipment parked / placed on roads obstructing free flow of traffic.</p>	instance.
9	Working at Height / Ladders and Scaffolds	<p>a) Not using or anchoring Safety Belt.</p> <p>b) Not using Safety Net.</p> <p>c) Absence of life line or anchorage point to anchor safety belt.</p> <p>d) Using Bamboo ladders.</p>	Rs.10,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance.
10	PPE	Not using proper PPE by any person at site.	Rs 100/- per incident.

39.3 Without limiting to the unsafe acts and or conditions mentioned above, the Employer shall have the right to deduct charges for any other unsafe act and or condition depending upon the gravity of the situation on a case-to-case basis. The charges shall be in comparison with that of the similar offence.

40.0 Disciplinary Policy Procedures

40.1 All employees are expected to comply with jobsite rules and regulations, and to follow established operating procedures set forth by this company. Violations shall not be tolerated and Project Manager shall be held accountable for the conduct of their employees.

Project Managers are required to take action when a violation is observed. Immediate action to control or eliminate a hazard is required.

In the event a violation is observed, the following procedures have been established to place an employee on notice.

Notice*

Action

* Within any consecutive 12 month period.

40.2 First Offense: A written warning addressed to the employee and a copy placed in the employee's file referencing the violation and warning, including date and time. If

the issue is still not corrected within the 24 hours after the issuance of the penalty, the Employer reserves the right to cite the employee for second offense.

40.3 Second Offense: A written warning addressed to the employee with reference to the violation including date and time of the occurrence. A copy of this warning shall be given to the employee, and another copy shall be placed in the employee's file. This warning shall be followed by a meeting with the employee, SH&E Manager, foreman and/or project manager to determine whether the employee shall be suspended without pay or terminated depending upon the nature of the violation. If the issue is not solved after the second citation, the Employer reserves the right to terminate the violator and/or Safety Office responsible for the correction.

40.4 Third Offense shall result in termination and permanent removal from the site. In addition to the termination, Employer or Employer's Engineer shall maintain proper documentation such that any Contractor/s do not employ the same employee for any of the DSIR projects.

41.0 Stoppage of Work

41.1 The Employer shall have the right to stop the work at his sole discretion, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and / or property, and / or equipment. In such cases, the contractor shall be informed in writing about the nature of hazards and possible injury / accident.

41.2 The Contractor shall not proceed with the work until he has complied with each direction to the satisfaction of Employer

41.3 The Contractor shall not be entitled for any damages / compensation for stoppage of work, due to safety reasons and the period of such stoppage of work shall not be taken as an extension of time for Completion of the Facilities and shall not be the ground for waiver of levy of liquidated damages.

42.0 Awards

- The following categories shall be considered for awards by the Employer based on the performance of all contractors:
 - i. For every safe million man hour working without any reportable incidents
 - ii. Zero fatality contracts
 - iii. 100% adherence to voluntary reporting of all accidents throughout the currency of contract
 - iv. Safest project team of the year.

- v. Best SH&E team of the year.
- vi. Safest Contractor of the year.
- The Contractor shall also declare the awards at least on quarterly basis for the individual workmen as well as teams for the safe execution of project in order to provide the motivation to all the workmen groups / teams.

43.0 Days to be observed for Creating SH&E Awareness

1 st Monday to Sunday of January	Road Safety Week (Subjected to confirmation from Ministry of Road Transport, Govt. of India every year.)
16 th February	Kyoto Protocol Day
March	Red Cross Month
May 1 to 7	Emergency Preparedness Week
4 th March	National Safety Day
7 th April	World Health Day
14 th April	Fire Safety Day
April 18 to 22	Earth Week
20 th April	Earth Day
20 th April	Noise Awareness Day
28 th April	ILO World Day for Safety and Health at Work Day
5 th June	World Environmental Day
12 th June	World Day against Child Labours
9 th July	Occupational Health Day
17 th October	World Trauma Day
1 st December	World AIDS Day

44.0 Minimum requirements of SH&E Communication Posters / Signages / Video

Every contractor falling into the above groups shall prepare a SH&E Communication Plan as a part of site specific SH&E Plan and shall include the following minimum requirement of Posters / Signages / Video as applicable. In case readymade posters are available in any of the category from National Safety Council, Loss Prevention Association of India or any other safety related organisations they may procure the same and display it. In case the same is not available then the contractors' shall make necessary arrangements to get the posters designed and printed on their own.

All the above are to be detailed in the Site SH&E Plan and get an approval from the Employer before displaying the posters.

Formation of Site SH&E Committee

Contract No _____

Contractor Name _____

Contract Title _____

CIRCULAR

Committee

The following SH&E Committee is constituted with immediate effect:

Chairman:

Members:

1)

2)

3)

4)

5)

Secretary:

Periodicity

The committee shall meet at least once in a month on the day (specify date)

Agenda

Secretary shall circulate agenda of the meeting at least two days in advance of the schedule date of the meeting.

Circulation

Minutes of the meeting shall be recorded in the standard format and circulated to the following under the signature of the secretary

1. Chairman

3. COMPANY Representatives

2. Members

4. Others concerned

MINUTES OF SAFETY MEETING

Contract No.:

Contractor Name

Contract Title

Meeting No.

Date of Meeting

Location of meeting

MEMBERS PRESENT

INVITEES

MEMBERS
ABSENT

Report sent to:

No of copies

Department

Prepared By:

Location:

Date:

45.0 Quality Management Plan

- 45.1 The intent of this guideline is to delineate a plan and procedure to be used by contractor, and its representatives, to assure the quality control necessary to provide for a complete, fully functional, high quality facility in accordance with the intent and meaning of the Contract Documents.
- 45.2 Quality is the totality of features and characteristics of a product or service that bear on its ability to satisfy a given need. The term 'given need', in case of project works, can be interpreted as the functional requirements. The quality of outputs is always agreed upon between the supplier and the client (in project works, contractor and the employer), and the objective must be to achieve zero defects in quality. It can be made possible only by ensuring the quality at all stages of project works.
- 45.3 Contractor shall be responsible for his Construction Quality Control – which shall be verified by contractor that all work performed is in compliance with the Contract Documents.
- 45.4 Contractor shall be responsible for Construction Quality Assurance - which shall be verified by the Employer / Employer's Engineer. Verification shall consist of the Inspection of the Work in place by the Employer's authorized representative using established inspection, sampling and testing procedures.
- 45.5 Contractor's responsibility

- 45.5.1 The contractor is responsible for controlling the quality of all the work including the work of its Subcontractors, vendors and suppliers; and for assuring that the specified quality of the work is achieved.
- 45.5.2 The contractor shall develop and maintain a Project Quality Plan (PQP) that is responsive to the requirements of the standards and specifications; and includes procedures necessary to assure compliance with the requirements of the contract.
- 45.5.3 Within 30 (thirty) days of the Appointed Date, the Contractor shall submit to the Employer a PQP including design quality plan.
- 45.5.4 The PQP shall explain the contractors approach to on-site quality control, off-site quality control, the PQP organization, documentation of the contractor and its subcontractors quality control activities, and provide all other information necessary to demonstrate to the Employer that the contractor, its subcontractors, vendors and suppliers shall provide quality control services that ensure compliance of the Work with the Contract Documents.
- 45.5.5 The contractor shall maintain control over construction and installation processes to assure compliance with specified requirements. In-process and final inspection and testing of construction shall be performed in accordance with written implementing quality control, test, and inspection procedures to assure that contract requirements have been met.
- 45.5.6 The contractor shall maintain control over construction and installation processes to assure compliance with specified requirements. In-process and final inspection and testing of construction shall be performed in accordance.

The results of all inspections shall be recorded on inspection checklists developed by the contractor and approved in writing by the Employer / Employer's authorized representative.

The contractor shall deliver a monthly quality control report to the Employer. This report shall address:

- Status of the contractor's QC Program including procedure development.
- Status of the management of the contractor's subcontractor/supplier(s) quality control.
- The list of inspections/tests performed during the month and results.
- Any quality problems experienced.
- Solutions to fix the problems experienced and their implementation schedule along with a method statement

45.5.7 It is the Employer intent that the workforce supplied by the Contractor, Subcontractors, Suppliers, Manufacturers and Independent Testing Agencies for this project meets or exceeds certain minimum experience qualifications, and that this experience can be documented based on other previous projects similar in size and scope to this project. The contractor shall provide evidence to demonstrate compliance with the minimum experience qualifications required herein upon request of the Employer. Whenever the Contract Documents use the terms listed below, Contractor shall ensure that the minimum experience qualifications stated below shall be met or exceeded by Contractor, Subcontractors, Suppliers, Manufacturers, and any Contractor controlled Independent Testing Agencies.

- Construction Manager: An individual who has performed a minimum of ten (10) years of related experience on projects of similar size and scope.
- Site Engineer: An individual who has performed a minimum of two (2) years of related experience working under the direction of a Supervisor. The site engineer can also be one who is an authorized representative of the manufacturer for the equipment in which he is installing. System Engineers such as Plant Control System, or other complete systems installations, an individual must have performed a minimum of five (5) years of related system installation experience working under the direction of a Supervisor. Installers must work under the direction of a Supervisor at all times.
- Manufacturer: Have a minimum of five (5) years' experience in manufacture and successful start-up of the specified equipment/design demonstrated by submitting a list of five (5) similar projects completed within the last five (5) years including project names and addresses; contact names, addresses and telephone numbers of Employer; and other any other information specified or requested by the Employer.
- Licensed Operators – Drivers/operators shall be fully and currently licensed and/or certified to drive/operate the type of vehicle/equipment which they drive/operate either on-site or off-site.
- Independent Testing Agency/Laboratory/Firm: Have a minimum of five (5) years) experience performing the specified independent testing required by the Contract Documents. Qualification data shall be submitted for Employer review and approval. Submit list of five (5) similar projects completed within the past five (5) years including project names and addresses; contact names, addresses and telephone numbers of proprietors; and any other information specified or requested by the Employer.
- The Employer may elect to interview management personnel provided by the Contractor specifically; the Project Manager, Quality Control Manager, Safety Manager and Field Superintendent prior to accepting these personnel for the Project.

46.0 On-Site Quality Control Manager

46.1 Overall administration of the Contractor's QC Program shall be under a full time, qualified, on-site QC Manager for the duration of the Contract. The QC Manager shall have at least fifteen (15) years of experience in quality control management and have at least ten (10) years of experience in quality control inspection on construction projects.

47.0 Project Quality Plan

47.1 The Contractor shall develop a written plan for implementing QC, tests, and inspection procedures. These procedures shall include but not be limited to:

- Instructions for performing the contractually required tests or inspections.
- Develop QC formats for all activities related to project execution and get it approved from Employer / Employer's authorized representative.
- The accept/reject criteria for each inspection activity listed on the checklist (i.e., applicable drawing, Specification section, industry code or standard).
- The frequency for performing the test or inspection as per relevant IS codes / MORTH latest edition/ specifications. These procedures shall be kept current and shall be available at all locations where they shall be used.
- Procedures shall provide for the identification and control of unsatisfactory or non-conforming material or conditions and for the prompt notification to the Employer / Employer's authorized representative with recommendations for corrective action.
- The Contractor shall include in its PQP the means and methods established for controlling the identification, handling, and storage of raw and fabricated material and inspection status of the material. These controls shall be maintained from the time of receipt of the material until delivery to the Employer, in order to protect the material from damage, deterioration, loss or substitution.
- Means and methods for inspection/testing procedures shall be included in the Contractor's plan to assure conformance with requirements for special process specifications such as welding, heat-treating and non-destructive testing of materials.

47.2 Work to be done away from the construction site is subject to inspection on behalf of the Employer during its fabrication, manufacture, testing or before shipment. The CONTRACTOR shall give at a minimum a four (4) week notice to the Employer of the place and time where such fabrication, manufacture, testing, or shipping is to be done so that the necessary arrangements for inspections and witnessing of shop tests can be made.

47.3 Certifications for personnel, procedures, and equipment shall be maintained as required to meet the requirements of the Contract Documents and all applicable codes.

47.4 In accordance with the General Conditions, the PQP is subject to periodic audit by the Employer / Employer's authorized representative to assure compliance with the Contract Documents.

48.0 Quality Assurance/Control of Subcontractors/Suppliers

48.1 The Contractor is responsible for controlling the quality of work performed by its subcontractors and suppliers. The Contractor shall instruct the Subcontractor or supplier to implement the PQP on all work performed.

49.0 Contractor's on Site Quality Control Testing and Inspection

49.1 The Contractor and its Subcontractors shall perform inspections, tests, and other services as required by the Contract Documents, the approved PQP Program, and in accordance with laws, codes, rules, and regulations and document the results on checklists as described herein.

49.2 Contractor shall provide written Request for Inspection (RFI) at least three (3) days prior to any on-site tests so that the Employer / Employer's authorized representative may witness the Contractor and/or Subcontractors on site tests. The Employer or Employer's authorized representative witnessing of tests does not relieve the Contractor and/or Subcontractors of their obligation to comply with the requirements of the Contract Documents.

49.3 The Contractor shall develop an inspection and test index identifying all required inspections and tests as indicated in the Contract Documents and the approved PQP program. The Contractor shall provide one copy of test and inspection results to the Employer's authorized representative witnessing the test, and maintain file of the original inspection and test results.

50.0 Quality Control Action Items – Employer

50.1 Unless otherwise directed in writing by the Employer, the contractor shall promptly undertake appropriate action at no additional cost to the Employer to respond and correct any unsatisfactory, non-conforming, or otherwise deficient conditions reported to the contractor by the Employer or Employer's authorized representative. These conditions may also be identified as a result of Employer inspections, audits or surveillances.

50.2 The contractor's refusal, failure or neglect to take appropriate action or to submit a written response within the time period requested shall constitute reasonable evidence that the contractor is not prosecuting the work or separable part, with the diligence that will ensure its acceptable quality within the applicable contract requirements and shall constitute sufficient basis for the Employer to recommend in accordance with the General Conditions to withhold any payment otherwise due, or identify and order alternate actions on the basis of the information in the contract.

50.3 In case of testing by independent laboratory indicates that Contractors and/or Subcontractors work fails to conform to the specified requirements, Contractor and/or Subcontractors shall correct the defective work, develop suitable procedures to ensure that any new work shall be in conformance with Specifications, and perform testing to verify that the corrected work and new procedures are in compliance with the Specifications; all at no additional cost to the Employer.

51.0 Manufacturers' Field Installation Services and Reports

51.1 When specified in the individual Specification sections, the Contractor and its Subcontractors shall require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, (test, adjust, and balance of equipment) and to provide instructions when necessary.

51.2 The Contractor shall report to the Employer / Employer's authorized representative in writing any observations and site decisions or instructions given by the manufacturers' representatives to the Contractor that are supplemental or contrary to manufacturers' written instructions.

51.3 The Contractor shall submit manufacturer's representative's reports (in duplicate) within 10 days of each field visit, to the Employer for review. If the durations of field visits are greater than one week, the Contractor shall submit weekly reports. Final report shall certify that the equipment or systems have been satisfactorily installed and are functioning correctly.

52.0 Elements of a Project Quality Plan

52.1 Introduction

52.1.1 The PQP is the basic quality document for the construction of a project, and it identifies project specific quality program commitments. The PQP assigns responsibilities and interface requirements for activities that affect quality. Activities that affect quality are those activities that affect the features and characteristics important to the quality of an item, such as soil compaction, concrete curing, etc. The PQP serves as the basis for QC procedures, which contain the administrative and implementation requirements for QC activities.

52.1.2 PQP must address the following program topics/elements as they relate to the equipment, material or service being furnished:

- Organization chart with responsibility matrix
- Methodology / Work procedure
- QA & QC plan

- Procurement plan
- Document control plan
- Unsatisfactory/ Non-conformance Control.
- Surveillance and Audit Attachments:
 - i. Inspection Reports
 - ii. Non-conformance Report
 - iii. List of Procedures
 - iv. List of Contractors and Suppliers E
 - v. List of QA Records

52.2 Organisation chart with responsibility matrix

52.2.1 This section of the PQP must:

- The contractor shall prepare organization chart specifying the responsibility matrix for the project.
- Describe how responsibility is exercised for the overall project cycle including oversight, and how contractor evaluates the performance of work by the delegated organization.
- Describe lines of communication between the Contractor / Subcontractor/suppliers.
- Organization charts shall clearly identify all on-site and off-site personals that function under the cognizance of the project quality plan (such as design, engineering, procurement construction, subcontractors, suppliers, etc.), lines of responsibility and a description of the size of the quality control organization including the inspection staff.
- Describe the delegation of contract work and the quality control responsibilities of each of the positions noted on the organization chart.
- Identify a management position that retains overall responsibility for the quality control program and which:
 - i. Is at the same or higher organizational level as the highest line manager responsible for performing activities affecting quality.
 - ii. Has communications with other senior management positions.

- iii. Has responsibility for preparation and approval of QC Manual(s).
 - iv. Have no other duties or responsibilities that prevent full attention to QC.
 - v. Has access to senior level management to identify quality problems; initiate, recommend or provide solutions to problems; and verify implementation of solutions.
- Require that verification of conformance to established requirements is accomplished by individuals or groups within the QC organization who do not have direct responsibility for performance of the work being verified and are independent from that portion of the Contractor's organization responsible for production.
 - Assure that QC personnel are sufficiently free from direct pressures due to cost/schedule, and have the responsibility delineated in writing to stop unsatisfactory work and control further processing, delivery, or installation of non-conforming material.
 - Document and make the corporate level policies regarding the implementation of the QC Program mandatory.

52.3 Methodology / Work procedure

This section shall include:

- Scope of work: The contractor shall define the scope of work to be executed for all components of work awarded under the contract.
- Reference documents: The list of documents governing specification of work shall be mentioned by the contractor
- Setting out: Procedure for setting out the activity shall be elaborated.
- Selection of materials: Specification & method of selection of all the materials required for executing the particular activities shall be elaborated.
- Equipment: List of all equipment for completing any particular activity shall be mentioned.
- Personnel for execution and supervision: Details of team members to be deployed for execution and supervision of all activities shall be mentioned.
- Sequencing of activity: Contractor shall mention the sequence of various component of work after studying the various components of scope of work.

- Work procedure: Contractor shall describe the methodology for carrying out each activity required to be completed in the project.
- Quality control: Contractor shall describe the procedure for quality control and quality assurance for all the components as per the Inspection Test Plan. The contractor shall prepare Inspection Test Plan in line with the bid specification and latest edition relevant codes.
- Work safety: Contractor shall do the safety risk analysis and specify the measures to be taken for ensuring work safety at site. It shall include the list of PPEs, plan for conducting safety awareness among workers, supervisors and engineers. Contractor shall follow the safety guidelines elaborated in this document.
- Environmental safety: Contractor shall describe the methodology for maintaining environmental safety at site.

52.4 QA QC Plan

This element of the plan must:

- Describe the scope of the QA/QC plan applicability.
- Establish provisions to assure that quality-affecting procedures required to implement the QA/QC plan are consistent with requirement as per bid specification and relevant codes and are properly documented, controlled, and made mandatory through signature of the responsible officials.
- Provide the quality affecting procedures to the Employer for review with documented agreement of acceptance prior to initiation of activities affected by the program and procedure.
- Address how management regularly assesses the scope, status, adequacy and compliance of the QA/QC plan to the contract requirements. Contractor shall maintain proper documentation of QA QC records & any other document pertaining to QA/QC.
- Prepare and maintain a listing of the Work that shall require special inspections.
- Describe the QC procedures that shall be implemented to ensure the Work requiring special inspections shall be completed in accordance with the applicable codes, standards, QC procedures and Specifications.
- Retention of qualification records of procedures, equipment and personnel associated with special inspections.
- Describe the scope of the inspection and test program and the organizational responsibilities for performing inspection and tests

- Ensure that individuals performing inspections and tests be independent of those who performed or directly supervise the activity being inspected.
- Establish and document the qualification requirements for inspectors and test personnel.
- Establish procedures for calibration (technique and frequency), maintenance, and control of measuring and test equipment (instruments, tools, gages, fixtures, etc.) used in acceptance measurement, inspection and testing. The Program/Procedures must:
 - i. Require the identification and traceability of measuring and test equipment to the calibration test data.
 - ii. Specify intervals of calibration based on the required accuracy, purpose, usage or other conditions affecting the measurement.
 - iii. Require calibration against standards that have a higher degree of accuracy than the equipment being calibrated to assure that the equipment being calibrated shall be within required tolerance.
- Include reference and calibration standards to be traceable to nationally recognized standards
- Describe inspection and test procedures, instructions, or checklists that include:
 - i. Identification of characteristics and activities to be inspected or tested.
 - ii. Description of the method for performing tests or inspections.
 - iii. Acceptance and rejection criteria.
 - iv. Prerequisites such as calibrated measuring and test equipment, instrumentation.
 - v. Method of recording or documenting inspection and test results and data.
 - vi. Inspection and testing formats
- Determine acceptability of inspection results or test data and results
- Establish requirements for training such that:
 - i. Personnel performing quality-affecting activities are instructed as to the purpose, scope and implementation of the quality control program and procedures.

- ii. Personnel verifying activities affecting quality are trained and qualified in the principles, techniques, and requirements of the activity being performed.
- iii. Documentation of training and qualification including the subject, content of the training, attendees, and date of attendance is maintained.

52.5 Procurement plan

This element of the plan must:

- Require that procurement plan are reviewed to determine that quality requirements are correctly stated, available for review and controllable; and there are adequate acceptance and rejection criteria.
- Describe the organizational responsibilities for the procurement of material, equipment and services including the interface between the design, procurement and QC organizations.
- Describe requirements for verification of subcontractors' and suppliers' activities during fabrication, inspection, testing and shipment of materials, equipment and components by the QC organization in accordance with written procedures to assure conformance to the procurement document.
- Require receiving inspection by the QC organization to assure:
 - i. Material, equipment and components are identified and conform to the procurement document requirements.
 - ii. The supplier furnished the documentation required by the Contract and procurement documents and that the documentation identifies the purchased item and the specific procurement requirements (e.g., codes, standards, and Specifications) met by the item.
- Describe measures for the control and identification of materials, equipment, parts, and components to preclude the use of incorrect or defective items. When Contract Documents require traceability in order to show locations, heat numbers, chemical analysis, physical properties or other inspection/test results for materials used, the Program must:
 - i. Establish procedures to assure that identification is maintained either on the material/item or on records traceable to the material/item.
 - ii. Require that correct identification of material/items is verified and documented prior to release for fabrication, assembly, shipment and installation.

- iii. Require identification to be traceable to the appropriate Contract Drawings; Specification; purchase / manufacturing / inspection documents; and physical / chemical test reports.
- Describe the control of the handling and storage of material, equipment, and components to assure that it is protected from damage and installed in accordance with the design Contract Drawings
- Require that procurement documents, to the extent necessary, require suppliers and subcontractors to provide an acceptable quality assurance plan.
- Assure that procurement documents identify applicable technical, administrative and reporting requirements; contract drawings; specifications; codes and industrial standards; test and inspection requirements; and special process instructions that must be complied with by suppliers.
- Require procurement documents to indicate that the work is subject to inspection by the Contractor and Employer / Employer's authorized representative during its fabrication, manufacture, testing, or before shipment.

52.6 Document Control Plan

This element of the plan must:

- Describe the scope of the document control plan and identify the types of documents to be controlled. As a minimum, controlled documents include:
 - i. Design documents (e.g., calculations, Contract Drawings, Specifications, analyses).
 - ii. Maintaining all correspondences and instructions and uploading in PMIS.
 - iii. Submission of all as-built documents.
 - iv. Developing and maintaining QA/QC manuals. Establish procedures for:
 - a) Assurance that changes to documents are reviewed and approved.
 - b) Assurance that the documents are available at the location where the activity shall be performed and obsolete documents are removed.

52.7 Unsatisfactory / Non-conformance Control

This element of the program must:

- Establish procedures for identification, documentation, segregation, review, disposition and notification to affected organizations of unsatisfactory/non-

conforming materials, parts, components, and as applicable to services.

- Contain a process where contractor records each and every quality incident for which non – conformance may or may not be raised. All such incidents shall be recorded in register and submitted to Employer on a weekly basis. All such incidents shall be rated with scale of 1 to 5 (5 being the most impactful).
- Perform re-inspection of items reworked, repaired or replaced to determine compliance with Contract Documents or approved engineering dispositions.
- Require non-conformances or unsatisfactory conditions to be corrected or resolved prior to the initiation of the preoperational test program on the item.
- Describe the scope of the QC records including a list of the record types which shall be generated as a result of implementing the program. QC records include results of reviews, assessments, inspections, tests, audits and surveillances; material analysis, monitoring of work performance; qualification of personnel, procedures and equipment, and other documentation such as Contract Drawings, Specifications, procurement documents, calibrations procedures and reports, non-conformance reports and corrective action reports.
- Identify the organizational responsibilities for the implementation of the activities related to QA & QC records.

52.8 Surveillance and audits

This element of the program must:

- Require an audit of the QC Program on an annual basis by personnel having no direct responsibilities for the area being audited.
- Establish requirements/procedure describing the audit and surveillance programs which includes:
 - i. Performance of audits and surveillances to pre-established written procedures or checklists by trained personnel having no direct responsibilities in the areas being evaluated.
 - ii. Analysis of data.
 - iii. Issuance of reports to appropriate management for action, review and assessment.
 - iv. Re-audit of deficient areas.
- Quarterly submission of audit report to Employer.

52.9 Substantial Completion and Inspection

52.9.1 General

The Contractor shall notify the Employer's Engineer and Employer when elements of the project are substantially completed. The Employer's Engineer shall arrange for inspection of the work, which, as a minimum, shall consist of at least a substantial completion inspection and a final inspection.

The date of substantial completion is determined by the Employer's Engineer and Employer in accordance with provisions mentioned in the Contract Documents.

52.9.2 Inspection Participants

Substantial completion inspections shall be arranged by the Employer's Engineer and Employer based on notification by the Contractor that the work is substantially complete. Mandatory participants include:

- Project Construction Manager
- Design Manager
- Employer's Engineer
- Outside agencies, required as per the Contract

The Employer may call for assistance from specialists in conducting the substantial completion inspection, depending on the complexity of the work.

52.9.3 Substantial Completion Inspection Guidelines

Contractor shall request the Employer's Engineer and the Employer in writing to conduct the inspection as per the Contract conditions.

The substantial completion inspection shall be structured to ensure that:

- The work has been completed in substantial conformance with the Contract in preparation for a final inspection.
- Work executed / Installed equipment satisfies the requirement properly as per specifications and contractual requirements.
- Required certificates of conformance and tests, field tests, and laboratory tests have been submitted.
- Warranties, tools and equipment, and O&M manuals are approved and available.

- All applicable Notices of Non-Conformance have been complied.

52.9.4 Results

If deficiencies are noted at the completion of the substantial completion inspection, the Employer's Engineer and Employer shall prepare a punch list for "Final Inspection/Project Closeout Process" as a guide to identify deficiencies found during the inspection. This document shall be signed by both the Employer's Engineer the Contractor.

If the work is found to be substantially complete, the Employer shall prepare a Letter of Conditional Approval for the Contractor.

52.10 Final Completion and Inspection

Final completion occurs after inspection and certification by the Employer's Engineer and the Employer in accordance with the Contract Documents. The final completion inspection includes both physical examination of the work and the examination of contract provisions and requirements to establish the Contract has been fully performed.

52.10.1 Inspection Participants

Those participants identified for the substantial completion inspection shall be invited to attend and participate in the final completion inspection.

52.10.2 Final Completion Guidelines

Guidelines regarding the final completion inspection include the following:

- Contractor shall request the Employer's Engineer and the Employer in writing to conduct the final completion inspection as per the Contract conditions.
- If the Employer's Engineer and the Employer find conditions satisfied, they then notify the participants of the time and place of the final inspection.
- During the final inspection, parties shall inspect the work and examine applicable portions of the Contract Documents.
- If the inspection is not satisfactory, Employer's Engineer shall prepare a final punch list and the Contractor shall correct items noted on the final punch list, followed by a request for final inspection.
- If the inspection is satisfactory, the Employer shall authorize issuance of the Notice of Final Completion. At that point, Employer's Engineer prepares a memorandum to the Employer stating that punch list items have been successfully completed and to recommend issuance of Final Acceptance.

Annexure I: MOU between Employer & Contractor for safe execution of contract work

This Memorandum of Understanding is made and executed by and between Employer or their authorized representative(s), hereinafter referred to as "EMPLOYER" (which expression shall wherever the context so requires or admits be deemed to mean and include its successors in business and assigns) of the one party

AND

M/s _____ having its registered office at _____ hereinafter referred to as the "CONTRACTOR" (which expression shall wherever the context so requires or admits be deemed to mean and include its successors in business and assigns) of the other party

WITNESSETH THAT

WHEREAS the EMPLOYER gives highest importance to the occupational safety, health and environment during execution of work, seeks cooperation from the CONTRACTOR in this endeavour.

Thus, this Memorandum of Understanding is for promoting the safety, health and environment aspects required to be followed at workplace/site and shall be applicable to any site job to be done by the CONTRACTOR

AND

WHEREAS the CONTRACTOR has read all the terms and conditions of the EMPLOYER and whereas the CONTRACTOR has studied the following documents:

Tender Documents, including Notice Inviting Tender, General Conditions, Special Conditions,

Conditions of Contract on Safety, Health and Environment and Project Safety, Health and Environment Manual.

Building and Other Construction Workers (Regulations of Employment and Conditions of Service) Act 1996, Central Rules 1998, Building and Other Construction Workers Welfare Cess Act 1996 and Rules 1998 and

Indian Electricity Act 2003 and Rules 1956.

Corresponding International / Bureau of Indian Standard Codes.

The amendments to any of the above rules and any other rules & regulations or procedures, circulars, notices & advices laid down by the EMPLOYER from time to time.

Now it is hereby AGREED AND DECLARED by and between the EMPLOYER and the CONTRACTOR as follows:

- Clause - I The CONTRACTOR shall abide by the terms and conditions stipulated in Condition of Contract on Safety, Health & Environment and Project Safety, Health & Environment Manual.
- Clause - II The CONTRACTOR shall undertake full responsibility for safe execution of job at work place/site and safety of his personnel and adjoining road users during work.
- Clause - III Without giving any prior notice, the EMPLOYER shall from time to time be entitled to add/or amend any or all terms and conditions with a view to improving safety and occupational health of personnel and safety of work, with immediate effect and the same shall be binding on the CONTRACTOR. The contractor agrees to implement all such amendments, which shall be laid down by the EMPLOYER.
- Clause - IV Besides following the guidelines, safety rules and regulations, safety codes given in various safety procedures / documents mentioned above, the CONTRACTOR shall also prepare detailed method statement which includes job safety analysis wherever there are complicated and hazardous/high risk working involved and get it approved from Employer before execution of work.
- Clause - V Any negligence or violation in implementing any of the provision of the conditions of contract on Safety, Health & Environment and Employer's project Safety, Health & Environment Manual shall be viewed seriously and the contractor is liable to compensate the employer for the loss of reputation. The cost of damage shall be fixed on case-to-case basis.

In witness thereof the Parties hereto by representatives duly authorised have executed this Memorandum of Understanding on _____ day of _____ 20____.

Signed on

Signed on

For and on behalf of Employer

For and on behalf of (Contractor)

Signature:

Signature:

Name:

Name:

Title:

Title:

Annexure II: Requirements for Construction/Establishment and Operation of Workers' Housing

1. Submission Requirements

The contractor should submit the following;

- a) Detailed Project Description (including number of residents)
- b) Setting out Plan
- c) Architectural Drawings/Details & Finishing Details of all Structures
- d) Drainage Layouts (Floor-wise and Setting Out)
- e) Colour Coded Layout of Potable Water
- f) Fire Detection and Fire Protection Layout

2. Site – General Requirements

The contractor should post sign boards on sites with the following information;

- a) Company Name
- b) Camp Owner and Manager
- c) Address
- d) Telephone Number & e-mail id
- e) License Number and Site Number

Sites for the camps shall be identified based on the following guidelines. The site shall be located;

- a) At a minimum distance of 1km away from any major settlement or village.
- b) At a minimum distance of 300m away from any major surface water course or body.
- c) Away from the pools, swamps, sink holes or other surface collections of water.
- d) Away from the overhead electrical lines.

- e) Away from the areas like sewage channel, sewage treatment plant, effluent treatment plant, waste dumping yard etc.

If this is not possible, sites for the camps should be located away from the settlements with the following precautions;

- a) Camps should be enclosed with boundary wall.
- b) Minimum clearances from the overhead electrical lines shall be maintained for the buildings.
- c) Movement of the workers should be registered during the night time.
- d) There should not be any disturbance to the local community.
- e) The construction of the Camp/housing shall be made of reusable, recyclable/sustainable materials to the maximum possible extent.
- f) The workers housing/camp shall be managed by an experienced Camp Manager and shall at all times be maintained free of drugs and alcohol use.

All sites used for camps must be adequately drained. The site should not be subject to periodic flooding. The camp must be located so that the drainage from and through the camp will not endanger any domestic or public water supply.

All sites must be graded, ditched and rendered free from depressions in which water may become a nuisance.

All sites must be adequate in size to prevent overcrowding of necessary structures.

The grounds and open areas surrounding the shelters must be maintained in a clean and sanitary condition free from rubbish, debris, waste paper, garbage, or other refuse.

3. Living and Sleeping Areas – Requirements

General requirements for living and sleeping areas in the camps are as given under;

- a) Each room used for sleeping purposes must contain at least 40 square feet of floor space for each occupant and shall be adequately ventilated.
- b) At least a 7-feet high ceiling must be provided.
- c) Beds, cots or bunks, and suitable storage facilities such as wall lockers for clothing and personal articles must be provided in every room used for sleeping purposes.

- d) Separate bed should be provided to each worker. Hot bedding and triple bunks are prohibited.
- e) Such beds or similar facilities must be spaced not closer than 3 feet both laterally and end to end, and must be elevated at least 1 foot from the floor.
- f) All living quarters must be provided with windows the total of which must be not less than one-tenth of the floor area. At least one-half of each window must be so constructed that it can be opened for the purposes of ventilation.
- g) All exterior openings must be effectively screened.
- h) Every shelter in the camp must be constructed in a manner which will provide protection to its tenants from the elements of nature.
- i) The floors must be kept in good condition.
- j) Adequate illumination level should be provided & maintained in the entire area of labor camp to avoid glare, irregularity & invisibility.
- k) No cooking shall be allowed in the accommodation areas. Heating Coils, Electric & gas stove should not be used in the accommodation/sleeping areas.
- l) Ceiling/wall mounted lighting and Fan should be provided in the each living area.

4. Shelter at Work Place – Requirements

At such work places where the duration of the works will prevail for more than one month, some form of shelters will be provided for meals, resting, change of clothes and for keeping the tools of the work and personal protective equipment. The height of shelter shall not be less than 3m from floor level to lowest part of the roof. Sheds shall be kept clean and the space provided shall be on the basis of at least 1.5 sq. m. per head.

5. Water Supply – Requirements

An adequate and convenient water supply, approved by the Employer's representative, must be provided in each camp for drinking as per IS Standard: SP: 35(S&T). For cooking, bathing and laundry purposes the containers shall be clearly marked a warning of "Not for drinking". Potable (drinking) water container shall be clearly marked and kept closed.

The distribution lines must be capable of supplying water at normal operating pressures to all fixtures for simultaneous operation.

6. Laundry, Hand Washing, Bathing and Toilet Facilities

6.1 Laundry, Hand Washing and Bathing Facilities – Requirements:

- a) Hand wash basin 1 per 15 persons.
- b) Shower head for every 15 persons.
- c) Laundry tray or tub for every 30 persons.
- d) Slop sink in each building used for laundry, hand washing and bathing.
- e) Floors must be of smooth finish but not slippery materials; they must be impervious to moisture.
- f) Floor drains must be provided in all shower baths, shower rooms or laundry rooms to remove waste water and facilitate cleaning. All junctions of the curbing and the floor must be coved. The walls and partitions of shower rooms must be smooth and impervious to the height of splash. An adequate supply of running water must be provided for bathing and laundry purposes. Facilities for heating water must be provided.
- g) Facilities for drying clothes must be provided. All service buildings must be kept clean.

6.2 Toilet Facilities – Requirements:

- a) Toilet facilities adequate for the capacity of the camp must be provided. Each toilet room must be located so as to be accessible without any individual passing through any sleeping room. Toilet rooms must have a window not less than 6 square feet in area opening directly to the outside area or otherwise be satisfactorily ventilated. All outside openings must be effectively screened.
- b) No fixture, water closet, chemical toilet, or urinal may be located in a room used for other than toilet purposes.
- c) A toilet room must be located within 200 feet of the door of each sleeping room. No privy may be closer than 100 feet to any sleeping room, dining room, lunch area or kitchen.
- d) Every water closet must be located in a toilet room. Each toilet room must be lighted naturally or artificially by a safe type of lighting at all hours of the day and night.
- e) Privies and toilet rooms must be kept in a sanitary condition. They must be cleaned at least daily.

6.3 General Requirements:

- a) Closed drainage system and sewage treatment system according to the local conditions should be constructed for the effective drainage and treatment. The sewage system built for the camp will be operated properly to avoid health hazard, ground water and soil pollution.
- b) Toilets, urinals and washing facilities shall be kept clean and in good working condition at all times.
- c) Toilets, urinals and washing facilities fittings shall be constructed of material which can be easily cleaned.
- d) Floor of Toilets, urinals and washing facilities shall be provided with slip free material.

7. Waste Water - Requirements

- a) No waste water shall be let to ground or other sources without proper treatment.
- b) Waste water from the camp shall be collected and treated in the treatment plant for reuse in non-potable water purposes.

8. Solid Waste – Requirements

Garbage bins facility shall be provided in a designated area with adequate hard surface. Access for clearance of garbage by designated persons and proper housekeeping shall be maintained in all areas of the camp at all times.

- a) Each block of living room in the camp must be provided with closed waste bin of adequate size and waste bin must be located within 100 feet of each block; waste bins must be emptied when full but not less than once in a day and cleaned immediately after emptying. Garbage containers must be kept clean.
- b) Regular Pest and Insect control measures shall be taken up to avoid mosquito/pest breeding.
- c) Sufficient cleaners shall be employed to ensure the buildings and sanitary facilities are always maintained clean and in hygienic conditions.
- d) Compost pits will be constructed for the disposal of the garbage and other bio-degradable wastes generated from the camps. Proper collection, transportation and disposal of the wastes will be ensured.

9. Kitchens, Dining Halls Facilities

- a) A properly constructed kitchen and dining hall adequate in size, separate from the sleeping quarters of any of the workers, must be provided in connection with all food handling facilities. There must be no direct opening from living or sleeping quarters into a kitchen or dining hall.
- b) Hand washing facilities equipped with detergent, towels and garbage bins should be available in the food preparation area.
- c) No person with any communicable disease may be employed or permitted to work in the preparation, cooking, serving or other handling of food, foodstuffs or materials used in any kitchen or dining room operated in connection with a camp or regularly used by persons living in a camp. Food handlers should have occupational health cards and should be trained on Basic Food Hygiene.
- d) Firewood shall not be used for cooking and heating purposes. Contractor must provide LPG gas / Kerosene for the workers camps.
- e) Liquefied Petroleum Gas (LPG) Cylinders when used should be kept outside the cooking area in a covered, well ventilated and locked area.
- f) Provide a mop sink or curbed cleaning facility, garbage bins washing area/facility and cabinets or room for storing toxic chemicals used for cleaning.
- g) Floors of kitchen should be made of impervious, water resistant, non-skid & easily washable type.
- h) The surfaces adjacent to cooking areas shall be constructed of non-absorbent, durable, easily cleanable, non-toxic and fire resistant materials.

10. Roads and Parking Areas

Access and circulation within the workers camp shall be provided for emergency vehicles, supply & delivery vehicles, maintenance and any other support vehicles. Emergency exits are to be clearly marked. Parking areas shall be provided for the emergency vehicles and campus maintenance vehicles. A minimum lighting of 20 Lux shall be maintained on roads and parking areas.

11. Day Crèche Facilities

At construction sites where women with very young children are employed, provision of a day crèche shall be provided. At construction sites where 20 or more women are ordinarily employed, a hut for children under the age of 6 years shall be provided.

12. Health Care Facilities

Health problems of the workers should be taken care of by providing basic health care facilities through a health centre set up at the workers camps. The health centre will have at least a doctor, nurses, duty staff, medicines and minimum medical facilities to tackle first-aid requirements for minor accidental cases. Some arrangements will be made with the nearest hospital to refer patients of major illnesses or critical cases.

The health centre will carry out quarterly awareness programme of HIV-AIDS with the help of AIDS control society. Posters will be exhibited in the health care clinic.

13. Electrical Facilities

General requirements for power supply system include;

- a) Electrical power supply to the camp facility shall be routed through ELCB/RCCB. All electrical equipment having a body of conductive material shall be provided with double earthing.
- b) Street and security lighting shall be provided in the workers camp.
- c) All outdoor installations for electrical equipment and accessories shall be weatherproof, corrosion resistant and in accordance to Ingress Protection (IP) requirements and specifications.
- d) All equipment, steel and electrically conductive structures, fences, etc. shall be connected to the Earthing grid.
- e) Diesel Generators shall be located away from the living accommodation and suitably sound proofed. Proper exhaust system shall be provided for the Generators.
- f) Qualified and experienced electrical/maintenance personnel shall be present and available within the camp at all times.
- g) Each habitable room in a camp must be provided with at least one ceiling-type light fixture and at least one separate wall-type convenience outlet. Laundry and toilet rooms and rooms where people congregate must contain at least one ceiling or wall-type fixture.
- h) Electrical equipment and installation must be fixed as per the requirement of Electrical Dept. and applicable regulations.

14. Leisure and recreation facilities

Leisure & recreational facilities shall be provided in the workers camp. Both indoor and outdoor facilities shall be provided; outdoor facilities shall have shaded areas/green areas. General requirements include;

- Recreation / community rooms installed with tables and chairs.
- Reading rooms installed with tables and chairs.
- Area for sports activities.

15. Fire Protection & Prevention

Adequate numbers of fire extinguishers and fire points with water / sand buckets shall be maintained. All the security and camp maintenance personnel and camp residents shall be made aware of fire prevention measures and usage of fire extinguishers. All staff must be trained in the use of firefighting equipment provided.

Provision of a public address system for use in emergency is also advisable.

16. Compliance with the requirements of Central, State and Local regulations

The contractor shall provide and maintain the Workers Housing, accommodations and site in a neat and sanitary condition for the use of the employees and workers as may be necessary and to comply with all the requirements of Central, State and Local regulations.